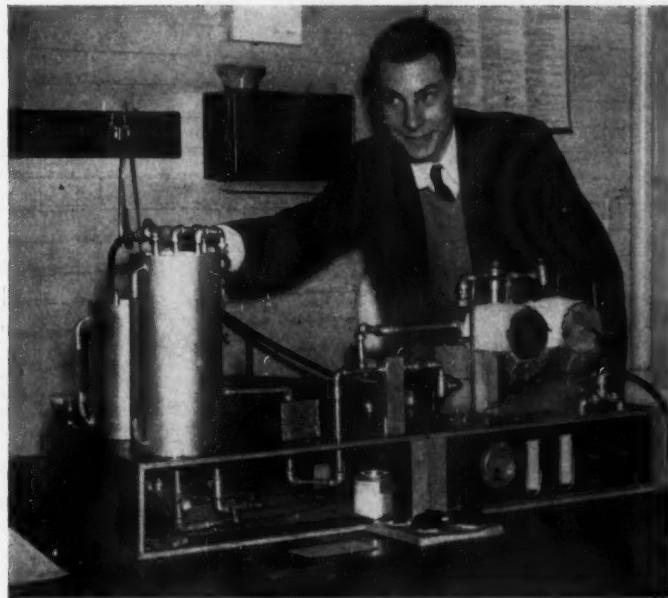


The Science Teacher



Model Coal Gas Manufacturing Plant—A Student Project
(Courtesy The Syracuse Herald Journal) (See Page 16)

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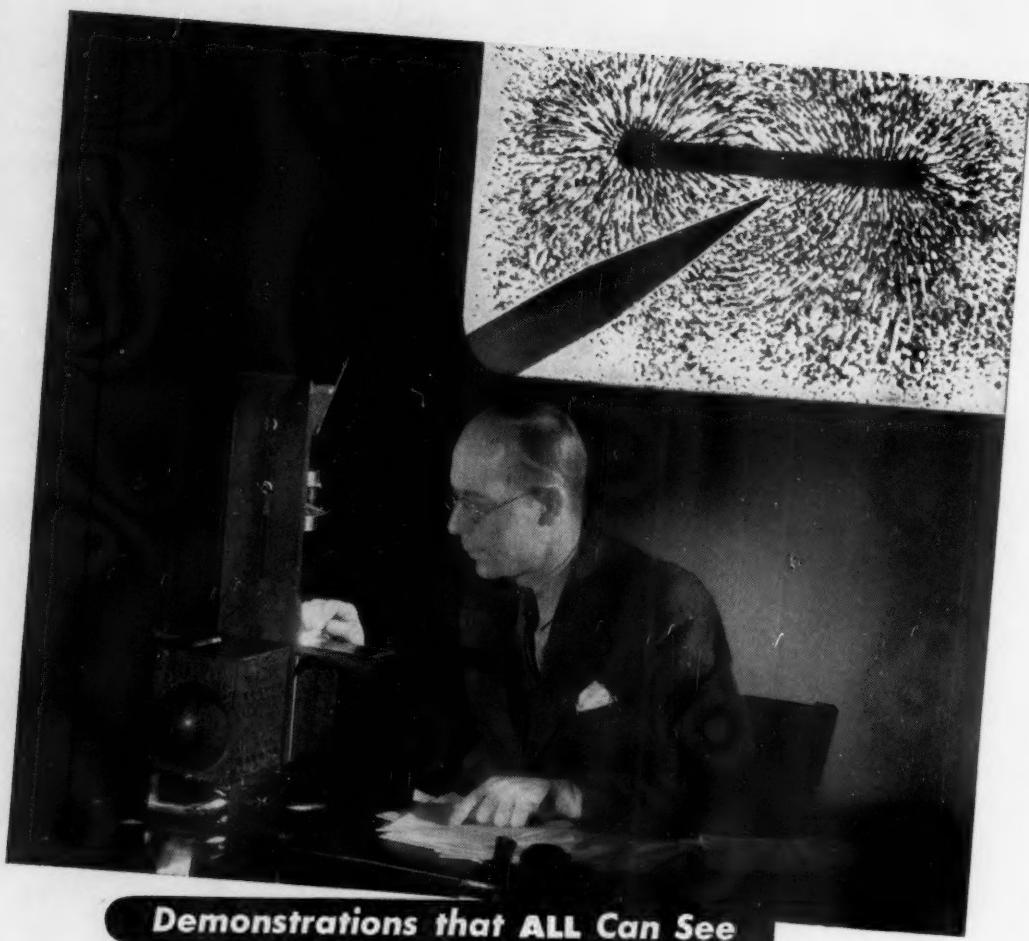
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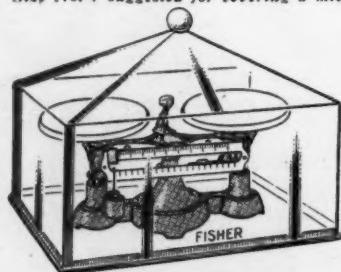
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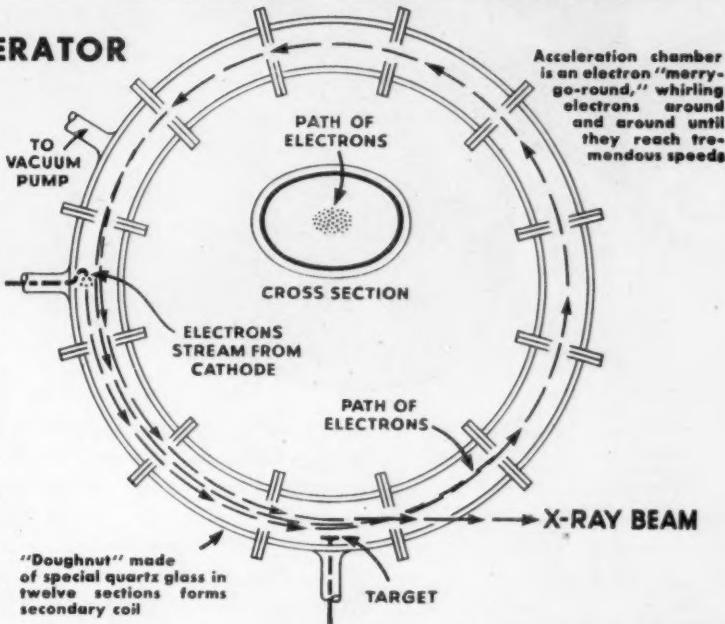
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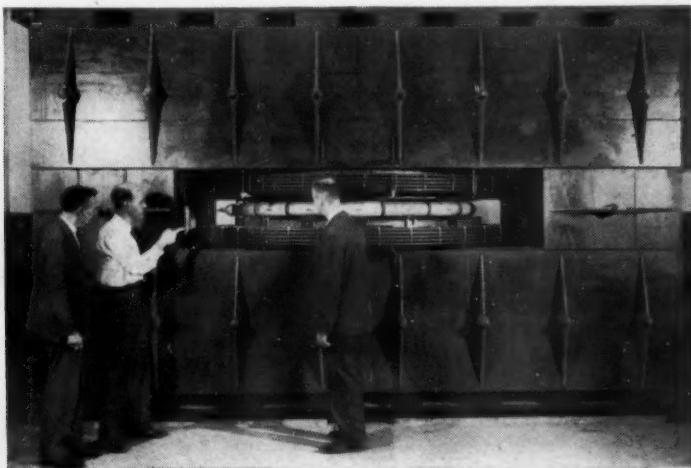
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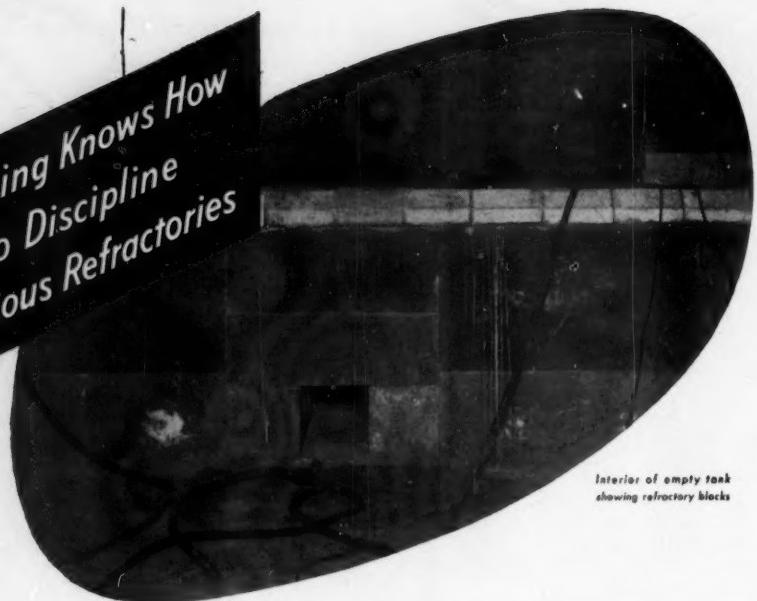
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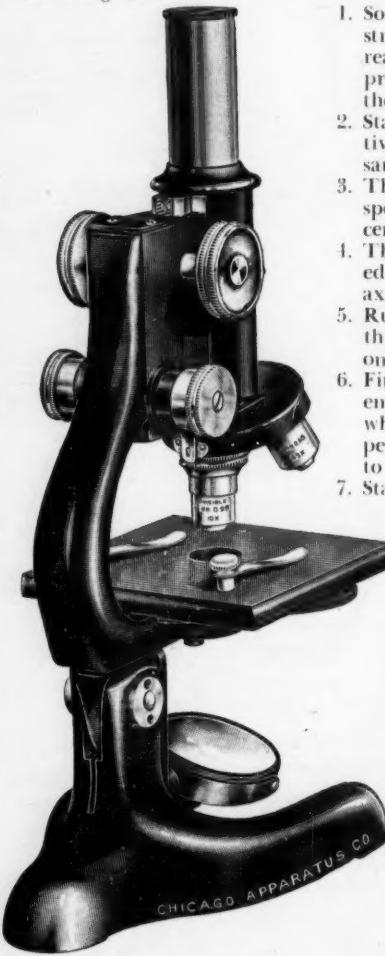
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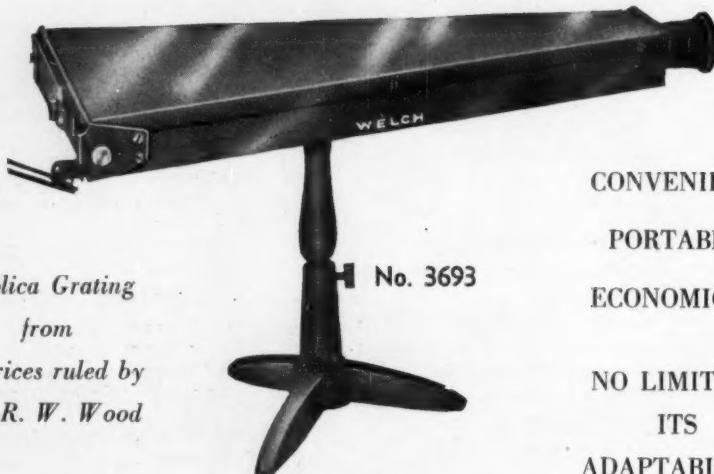
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VOLUME XIII

FEBRUARY, 1946

NUMBER 1

How the Teaching of Biology Can Help to Make Conservation Work

SHIRLEY W. ALLEN

Professor of Forestry, University of Michigan

Ann Arbor, Michigan

THE MOVEMENT in this country for the conservation of natural resources got its real start, or at least its name as such and its dramatization, from the stirring days of 1905-1910 when an economy of scarcity and an exploiting philosophy were smart and respectable. Plenty of scientists had long worried over the waste of natural resources and weak attempts had been made to halt destruction of natural resources through restrictive laws. Some ill-advised subsidies of land or deferred taxes had been offered for bona fide settlement, cultivation, tree planting, or colonizing. We knew little enough of the techniques of (1) preventing waste in use, (2) improving productivity of the resource when feasible, and (3) seeing to it that distribution, in the economic and social sense, was made more equitable. These are the three "R's" of conservation even though they involve a great deal more than 'readin', 'ritin', and 'rithmetic.

It was perhaps natural that geologists such as Van Hise of Wisconsin; hydrologists such as McGee and Newell; foresters such as Fernow, Pinchot, and Roth; soil scientists such as Bennett; and naturalists such as Baird and Audubon should see what was ahead and reason that each in his own branch of science could find the answers to some of the tough scientific problems. Some of these are reducing waste in exploiting minerals; harnessing, controlling, and using water; making natural forests produce more and establishing forests on bare and non-agricultural land; halting the washing away of topsoil; and, mildly,

finding out what was happening to our commercial fisheries and suggesting remedies for diminution. Here and there an explorer such as Powell questioned the waste involved in the non-use of arid lands, or an economist such as James or a political scientist such as Spaulding saw that our national economy was a matter of good management of natural resources as well as management of sorts of the other factors of production.

AS A YOUNGSTER in the public schools in the 90's, I can remember a "reading circle" to which a few of us might be assigned on certain Friday afternoons (if our parents could afford to buy the book), in which we read aloud from "Our Friends in Feathers and Fur." On alternate Friday afternoons someone was sure to recite "Woodman Spare That Tree" and three or four starched little girls would sing:

Oh the North Wind will blow
And we shall have snow
And what will poor Robin do then
Poor thing
And what will poor Robin do then.

As I remember it, he would fly to the barn and hide his head under his wing (poor thing—a bit off biologically, I'm afraid.)

Arbor Day was almost religiously observed, and if a tree could withstand our shinny games on the school grounds, it grew and was "like a tree planted by the rivers of water."

Later, the Junior Audubon Clubs became common, scouting was started, and 4-H Clubs

got under way, and, best of all, the real and thoughtful teaching of biology became common in the public schools. All of which brings me back to my subject "How the Teaching of Biology Can Help to Make Conservation Work."

THERE is no substitute for a well-informed people in making what we call conservation, really work. So I should say that what the biology teacher is doing *now*, is of vast importance. I take it that the immediate objective of teaching biology at any level is to impart knowledge, demonstrate principles, and inspire a will to inquire into the fundamentals of life processes. Happy indeed is the teacher who has aroused a student to ask intelligent questions on the life history of any given plant, the fascinating field of adaptation, or any one of a dozen other fundamental things in biology. Thorough and live teaching is the *first* thing, then, that can help to make conservation *work*, and I am carrying coals to Newcastle when I stress so obvious a thing.

But we are a doubting and practical people at home, somewhat gadget-minded, and always we are asking, "So what?" "What door will the Sigma Xi key open?" "What's the application of all this?" "What are we supposed to learn?" Brutally, "What good does it do anybody to know that there are more than twenty kinds of June bugs, that there is such a thing as heliotropism, that animals exhale carbon dioxide, or that owls regurgitate bones and fur, or that Towser doesn't chew as we do?" Well, teaching loses nothing by employing *as a device* the interesting examples of the application of biological knowledge. Conservation, on the other hand, gains a great deal.

For example, the twenty kinds of June bugs may have twenty, or at least fifteen, kinds of food preferences. If one kind is found in certain sampling numbers on a proposed reforesting area, he will live on something *besides* the roots of tiny pine trees. Go ahead and plant. If another occurs, better change the project to another site where trees have a real chance for survival. This is an application of biological knowledge to a conservation problem: How do we put idle non-agricultural land back to work growing a profit-

able forest? Why are those tomato plants in the window so crooked? They seem puzzled as to which way is up. Will they be well-formed when our April winter goes and it is time to plant them out? Has this anything, in these days of victory garden fervor, to do with heliotropism? With conservation? And if any family is so fortunate as to have wood to burn, why may the wood ashes in the fireplace accumulate all winter and hardly pile up at all? Is that all that is left of wood? What is wood made of anyway? Any carbon in it? Any particular form in which the tree takes it from the air? Does any animal, possibly, have a part in supplying some carbon dioxide? What is left in the ashes? Can a plant use it again? Would it hurt or help the compost heap out there by the garden? Do the insects that will get after cucumbers, *like* wood ashes? Might the ashes conserve soil fertility; cucumbers, human strength? And so on far into the next hour.

So far as Towser's table manners are concerned, the peculiar foods that have to be chewed by dogs might lead to a discussion of the carnivores, their reputation in the wild state as predators, and the use of predators in maintaining strong individuals and good stock for the hunters, among the animals on which the predators prey. An animal that eats other animals may be something of importance in the conservation picture. (After all, man is such a one). Better examples of the application of biological principles, I know, are popping out of the heads of biology teachers every day and the *more* the better!

NO GREATER reward, I think, comes to a teacher than the conviction that intellectual curiosity has been developed in the student. Anything that will stimulate this sort of thing is useful. So a third way to do something to make conservation work is to use generously of bulletin board material even if it is necessary to cut to pieces the last number of an attractive copy of *Nature*, *The National Geographic Magazine*, *American Forests*, *The Michigan Conservationist*, or *Ann Arbor Conservation Notes*. This will usually not be necessary, for generous pictorial material is available from the garden and outdoor pages of many of our daily papers. And if my ob-

servations are not too inaccurate, the trend in picture and story is more and more toward the constructive and less and less toward the gallery of horrors—the wailing walls of past exploitation. Good material on the bulletin board with good interpretative captions supplied by teacher and class seem to me to be necessary and stimulating. They help to make conservation work.

With heavy teaching loads, crowded laboratories, and scattered homes from which public school students come, the matter of promoting special projects and following up on them is not too easy. But a word of suggestion and encouragement may afford a chance for some young person really to participate in conserving a nearby natural resource. Night-crawlers for bait—how do you get them started? What do they live on? Can they prosper without lime? How moist should their apartments be? Can you actually raise fishworms? Is it good to have them about the shrubs and in the garden? If you want them for bait, how do you keep them from leaving?

HOW GOOD is the soil in the home shrub beds or the garden? Should we sit and brood over Chamberlain's estimate of 10,000 years to make a foot of soil? Clay, furnace ashes, and compost can become modified in three years so that it is hardly recognizable. If the wood ashes, with the lime and potash which they carry, are available, there are plant nutrient materials as well as improvers of the non-baking qualities of the site. Why burn leaves, lawn clippings, leafy parts of the garbage, and immature weeds? The student who starts and maintains a compost heap is a soil-maker and a speeder-upper. I should say he is a *conservationist*.

The never-ending joy of attracting birds is a far cry, but not too far a one, from conservation activity. Probably it is the best understood of the projects usually available.

IN COMMUNITIES where the countryside is not too distant or hard to reach, the school forest continues to afford opportunities for real participation in conserving something. Seed collection, storage and nursery establishment are making some headway. Marsh or

pond improvement with planting of duck-potato, wild rice or other waterfowl forage is being explored in a number of rural school areas. Winter feeding of bird populations after heavy storms can be effective if well-organized in cooperation with organizations willing to finance the work. And, of course, the 4-H project opportunities are almost innumerable.

And now let me talk more of the teacher than the teaching. Associations and informal groups with conservation objectives need informed and skilled talent in their membership. Otherwise they frequently go all-out for crow-shoots, bounty campaigns, and other spectacular but ineffective projects. They need intelligent guidance on the legislation which requires support and in the study of such questions as the control of game species which become pests, flowers which assume the role of weeds, killers who pose as sportsmen, and animal lovers who refuse to be realistic on questions of harvesting the game and fur crop. Most of the women biology teachers would not feel particularly at home in the M. U. C. C. (Michigan United Conservation Clubs) or the Izaak Walton League or the Detroit Sportsmen's Congress, all of which have the ear of the Michigan Conservation Commission and the Legislature. But their present students will be the members of these organizations tomorrow. Men teachers should by all means be members of such local groups. For all, the Michigan Forestry and Park Association, local bird clubs, Friends of the Land, The American Forestry Association, and The Michigan Academy of Science, Arts, and Letters are open and needing the kind of help biology teachers can give. So, *first*, you can help these groups, and, *second*, they can inspire you.

In summary, the training of the biology teacher can help to make conservation work:

- I. Through the kind of teaching now done, which aims to impart fundamental knowledge and which always hopes to arouse intellectual curiosity.
- II. By having in mind and using as a teaching device interesting examples of the

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Dr. Philip Johnson — Specialist in Science

The United States Office of Education announced January 30 the appointment to its staff of Philip G. Johnson of Cornell University as specialist for the natural sciences in the Instructional Problems Section of the Division of Secondary Education. He was recommended for the position by John W. Studebaker, United States Commissioner of Education.—Editor.

THE UNITED States Commissioner of Education would not have invited Dr. Philip G. Johnson to assume the duties of Specialist in the Office of Education, had he not been convinced that his choice possessed a superior background of teaching experience, a proved scholarship, a demonstrated professional spirit, a record of organizing ability, a tested craftsmanship in speaking and writing, plus that personality that makes a pleasant associate.

The Commissioner knew that Dr. Johnson has contributed much to science education and will contribute more; that he is well-known and will become better known; that he is wise and will become wiser.

Philip Gustav Johnson's experiences began on the infant level in South Central Nebraska, at Loomis. A very large map shows the approach of Elm Creek to the town, and faint indications of rolling hills. The time was Autumn in the first year of the Naughty 'Oughties, Philip missing some of the experiences of the Gay Nineties that his elders enjoyed. The date was September 21, in case you send cards.

AT THE AGE of twenty-two he received his Bachelor's degree from the University of Nebraska at Lincoln. From this normal progress we may infer that he never missed a grade. He at once accepted a position as science teacher in the high school at Havrelock, in the University's shadow. Two years later he was made science supervisor in the University High School, having probably had his eyes on that job for a long time.

This work continued for six years, during which period Johnson gradually matured into a Master, achieving that distinction at the age of 31. Opportunity then knocked (or may have been enticed to the door) in the form of a Charles Lathrop Pack Fellowship at Cor-

nell University, Ithaca, New York. Two years beside Lake Cayuga's waters brought the Doctorate. Then back he went to Lincoln, with the rank of assistant professor in the School of Education at the University, and supervisory duties in the training school.

But Johnson had made a mark at Cornell. Two years later, at the age of 35, he reversed the westward trend of young men and became assistant professor of secondary education, and director of teacher training in science at Cornell University. His duties also involved supervision of science instruction in the public schools of Ithaca, in a region rich in natural life and geological curiosities.

THE YEARS at Cornell have been busy ones professionally for Professor Johnson. He has been active in many organizations that promote the interests of science teachers. He is a meeting-attending member of the American Association for the Advancement of Science, the National Association for Research in Science Teaching, the American Science Teachers Association, the American Nature Study Society. He was entrusted with the correspondence and the funds of the New York State Science Teachers Association. He aided in the scholarly examinations of Phi Delta Kappa.

In 1942 Dr. Johnson became president of the National Education Association's Department of Science Instruction. This was a time when a merger with the American Science Teachers Association seemed wise. The latter organization was a vigorous affiliate of the American Association for the Advancement of Science. In the conferences and correspondence that followed, Dr. Johnson showed talents as an adjuster of conflicting viewpoints that caused his colleagues to dub him "a modern Daniel Webster—the Great Conciliator—without the oratory."

It was most proper that he became the president of the American Council of Science Teachers in 1943, and of the resultant National Science Teachers Association in 1944. This organization now considers itself the very

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THE SCIENCE TEACHER

This and That

NORMAN R. D. JONES

Vice President and Membership Chairman

President Honored

OUR PRESIDENT, Dr. Philip G. Johnson, was recently selected to fill the position of "Science Specialist" with the United States Office of Education in Washington, D. C. Dr. Johnson rightly deserves this honor and recognition for the excellent leadership he has shown in the advancement of the National Science Teachers Association. We shall be looking to Dr. Johnson for "bigger and better" achievements. Again, "Congratulations, Mr. President."

News

The Puerto Rico Science Teachers Association, an N. S. T. A. affiliate, recently had Dr. Watson Davis of Science Service as their guest speaker. This fine group now has approximately 100 N. S. T. A. members.

Miss Greta Oppe, Southern Area vice-president, recently spoke before the regional meeting of the American Chemical Society at the University of Texas, on "Opportunities for Women in Chemistry."

Mr. J. A. Perino, 2991 24th Street, San Francisco, who is vice-president of the Northern California Science Teachers Association, an N. S. T. A. affiliate, is making a study of the "Time Allotment to Science." Will you please write him as to the practice in your school on double or single periods for laboratory work, enrollment of school, size of classes, etc.

Mr. Arthur O. Baker, Board of Education, Cleveland, was elected president of the Central Association of Science and Mathematics Teachers at its November meeting. Mr. Baker is serving on a committee for the N. S. T. A. Biology Section. Also Dr. Charlotte Grant, Oak Park (Illinois) High School, an N. S. T. A. director, was elected vice-president of this organization; and Mr. Fred Moore, N. S. T. A. Central Area vice-president, was chosen on their executive committee.

Mr. Jacob W. Shapiro (Tennessee Director) recently spoke before the Tennessee Academy of Science. He is chairman of a committee of this organization to encourage

student participation in the Westinghouse Science Talent Search.

The Northern California Science Teachers Association, an N. S. T. A. affiliate, held its fall meeting at the University of California. At this fine meeting more than 500 were in attendance.

Our British Members

MANY members of the Science Masters' Association of Great Britain have recently availed themselves of memberships in N. S. T. A. A welcome is hereby heartily extended to you.

The Science Masters' Association is for schoolmasters in schools corresponding to our high schools. They also have many university members. This organization is comparable to N. S. T. A. Their official journal is "The School Science Review", which is published three times a year. They hope soon to return to four publications yearly. Membership without proposal is available to our members with an educational standing (B. S. Degree) equivalent to that of their members.

Until October, membership fees are 10 shillings (approximately \$2.00), after which it will be 12 shillings 6 pence.

Money for membership may be sent by international money order, payment order from your local banker to an English bank, or a bank draft made payable on an English bank. If you desire a membership, state your degrees, teaching experience and enclose your money in one of the above mentioned ways. Send to: Mr. E. H. Coulson, Dollarbeg, 8 Clockhouse Way, Braintree, Essex, England.

IN SUMMING up the relationship established between the Science Masters Association and N. S. T. A. one member wrote: "I should like to express my opinion, which I feel sure is shared by my colleagues, that any attempts on our part to understand one another's work, discuss our respective methods of science teaching, etc., cannot fail to have worthwhile consequences and bring mutual benefits."

Blood Typing — A Study in Genetics

MARY CREAGER

Chester High School

Chester, Illinois

IT IS NO trick to teach students a subject in which they are interested. Normally high school students are interested in themselves, and they like to learn things about themselves. If a teacher explains that each human being has inherited one of four types of blood, that is, A, B, AB, or O and further states that she is going to type the blood of each student who wishes to learn his blood type, she immediately has the attention of her class.

"Which type is the best?", will almost always be the first question asked. Of course, there is no "best", although one with the rare type, AB, might have difficulty finding a suitable donor should he need an emergency transfusion. The question, however, opens the way for an explanation of how blood types are inherited. The assumption is that the blood typing is to be done during the study of a unit on genetics and that the students already have an understanding of the laws of simple Mendelian inheritance. The explanation can then be easily understood by the students.

BLOOD typing tests are based on the fact that all human beings, according to Landsteiner's original investigations, belong to one of the following groups: A, B, AB, or O. This provides one of the clearest examples of Mendelian gene action. Only three blood genes act in producing the four groups. These genes may be designated by the letters, A, B, and O. The blood of different persons varies slightly in the nature or presence of substances known as agglutinogens in the red corpuscles. Agglutinogens stimulate substances in the plasma known as agglutinins, which cause the blood to coagulate. Normally the agglutinogens and the agglutinins work together in the body, but when blood is transfused from one person to another whose blood is a different type, the difference in the agglutinogens may cause clumps of blood to form, plugging the capillaries in the lungs, kidneys, or brain. The death of the person usually follows. In order to be prepared for emergency blood-donor service, every healthy

person should have his blood typed.

There are apparently two kinds of agglutinogens in the red corpuscles. One kind is designated as A, and the other is designated as B. If A is present in the red cells, the blood type is A if B is present, the blood type is B; if both A and B are present, the type is AB. If agglutinogens are lacking, the blood is designated as type O. Each person inherits two genes, a single one from each parent. Therefore, a person may receive two genes of the same kind, AA, BB, or OO; or a mixed pair, AB, AO, or BO. If a person receives the genes A and A or A and O, his blood type is A. If a person receives the genes B and B or B and O, his blood type is B. A person receiving the genes A and B has AB blood, while one receiving O and O genes has O type blood.

APPARENTLY A and B genes are dominant over the recessive gene O, but A and B are not dominant over each other. Both show up when present. From this many interesting problems in inheritance can be worked by the students.

The following table by Landsteiner shows the groups of children possible and those not possible from the various groups of parents.

Groups of Parents	Groups of Children Possible	Groups of Children Not Possible
1. O X O	O	A, B, AB
2. O X A	O, A	B, AB
3. O X B	O, B	A, AB
4. A X A	O, A	B, AB
5. A X B	O, A, B, AB	
6. B X B	O, B	A, AB
7. O X AB	A, B	O, AB
8. A X AB	A, B, AB	O
9. B X AB	A, B, AB	O
10. AB X AB	A, B, AB	O

The technique of blood typing can be quickly mastered by the teacher or student, but, first, perhaps something should be said in regard to nomenclature. Sometimes a person may be heard to say that he has Type I blood or Type IV. From the table below the nomenclatures

of Moss and Jansky may be compared with the International Nomenclature, as follows:

International	O	A	B	AB
Jansky	I	II	III	IV
Moss	IV	II	III	I

The equipment needed for typing blood is simple and inexpensive except for the Serum A and Serum B. The author has for the past six years obtained very reliable sera from the Gradwohl Laboratories in St. Louis. Other materials needed are clean slides, a wax pencil for making rings on the slides, a few pipettes, a small vial with a cork for each student, a lancet for piercing finger, alcohol, cotton, a microscope, saline solution (0.85%). Note: The saline solution must be made with distilled water.

HAVE READY all of the needed materials on the day planned for the typing. Do not try to do too many in a period. On each slide should be drawn two wax rings. The one to the right should be marked A, and the other B. Each slide should be marked with the student's name or initials.

Also a bottle partially filled with saline solution should be marked for each student. Slides marked consistently may help avoid errors when applying the sera.

First make a 2—5% suspension of the unknown blood cells in saline solution (0.85%). Place a drop of the blood cell suspension in

ring A and another in ring B. Be sure to wash pipette used to thoroughly transfer cell suspension and rinse with distilled water before typing the next student. Place one drop of Serum A on the spot of blood cells in ring A; place a drop of Serum B on the spot of blood cells in ring B. In handling the grouping sera, be sure to avoid touching the drop of blood with the end of the pipette. Avoid touching anything with the end of the pipette. This is sterile material and the entire procedure must be kept sterile.

Agitate the slide for three to ten minutes. One should have a very definite reaction in that time.

EXAMINE the spots both macroscopically and microscopically. Read the results as follows: If the blood spot receiving the A serum is not agglutinated, and that receiving the B serum is agglutinated, the unknown belongs to group A. If the blood spot receiving the B serum is not agglutinated and that receiving the A serum is agglutinated, then the unknown belongs to group B. If both spots are agglutinated, then the unknown belongs to group AB. If neither spot is agglutinated, then the unknown belongs to group O.

Students having type A and type AB blood may be subgrouped into A₁, A₂, A₁B, or A₂B. For the subgrouping Absorbed B serum is

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Biology students of Chester High School are here taking blood and determining its type.



The Neglected Unit in Science Instruction

CARROL C. HALL

Springfield High School

Springfield, Illinois

ROCKS AND minerals are basic raw materials of chemistry. From them come many of the elements and compounds important to the science. Yet, instructors in chemistry—particularly at the elementary level—neglect the study of this important phase of the subject.

Time spent on mineralogy (one or two days at the minimum) is valuable in a beginning course. The subject is best introduced early in the second semester's work. If nothing else, it will serve to bolster up the weakest section of general chemistry instruction—the review of the various periodical groups.

Study of rocks and minerals is an 'interest-gaining' activity for most high school youngsters. In the conventional secondary school program of the present, chemistry affords the only opportunity for them to be introduced to this field of study. For many of them it is an "eye-opener."

If we as teachers of chemistry are sincere in our desire to impress on the high school pupils the fact that "matter is neither created nor destroyed", study of minerals affords an excellent opportunity. Then, too, here is an opportunity to impress on them a sense of geological time and of earth forces of which most of them have little concept. There are many stories and historical facts in connection with this study that are intellectually stimulating and broadening. General education should include this material.

INSTRUCTORS introducing this unit will be surprised to learn that many youngsters already have interest and may have their own collections. Specimens brought from their collection to class have a stimulating effect. There are a number of hobby activities in connection with minerals that are of interest: For example, in my own case I am particularly interested in fluorescent minerals and have arranged a demonstration on them. Just recently, one of my students—son of a mining engineer—told of his collection (and exhibited samples) of minerals obtained from the central Illinois coal mines. One of the

best student topics I have ever heard came from an amateur mineralogist in one of my classes.

To test out the feasibility of this unit, place a number of rock and mineral samples on your demonstration desk. See how quickly the youngsters gather round and begin asking questions. If you don't know the answers, perhaps some in the group will—if not, get busy and read up; it is an interesting study!

In starting a unit of study—let's say on fluorine—exhibit some samples of fluorite; tell some of its characteristics. Let the students know that it is mined in Illinois (local pride!); see if such a procedure doesn't give the study a better send off.

Inexpensive mineral collections are available at most supply houses. Your school collection will soon be augmented by gifts from members of your classes. There may be an interesting collection in your community which can be visited or borrowed from. In my case I have access to the Illinois State Museum, which houses one of the outstanding collections in the United States.

TO MY knowledge there is only one high school chemistry text¹ that introduces a study of rocks and minerals. A unit can be developed, however, by a teacher without too great trouble.

Give rocks and minerals consideration in your course of instruction in chemistry. It is my firm belief that to teach a course without this material is in effect robbing the student of an essential section of the total story of chemistry.

¹—Modern Life Chemistry. Lippincott. Unit 9, Mineralogy and Chemistry. Problem 1. What is the nature of Mineralogy?

OUR FRONTISPICE

The student project shown on the cover is a part of the Junior academy exhibit at Syracuse University last April. A complete story of this meeting will be in the April issue of *The Science Teacher*.

What to Do With a Bulletin Board

GRETA OPPE

Bell High School

Galveston, Texas

Did you ever try using a bulletin board in the chemistry laboratory to visualize not only what is taking place in the test tube but to make a chemistry lesson come alive? The experiences here are those in a chemistry laboratory down in Texas. So effective has been its use that there is a regular bulletin board file from men and women of industry as well as from former students who studied in that laboratory.

Too often a bulletin board is just what its name implies, a place to hang bulletins. There are, however, so many ways to use a display board to interest the student and so much appropriate material with which to teach a lesson. Best use of the board comes from planned unit or lesson displays. Some of these planned displays are described here.

AM SURE we all hunt for a "commencing note" when our schools begin. Advertising material is always a great help here. You may possibly recall the advertising pages of Union Carbide and Carbon Chemical Corporation, "Here Comes the Future"—a world of tomorrow with infinite potentialities, and "The Chemistry Lesson" that appeared last fall on the pages of many of our popular journals.

The history of chemistry is easily visualized. Once a student found a colored page illustrating "Nature's Alchemy" making us conscious of the changing season.

The practical aspects of the content of chemistry are well illustrated by a display board, not only the uses but the problems involved. The educational departments of big industries are doing a good job. The Dow Chemical Company through its advertisements has certainly taught us a lot concerning magnesium and sea water. In like manner, we have learned much from the pages of the Aluminum Company of America. The various rubber companies and oil corporations have furnished us with a lot of free information.

NOT ONLY is this worthwhile chemistry but sound vocational guidance, for not all of the students who study chemistry will prac-

tice chemistry as a vocation. Some desire to be journalists and commercial artists. Here is a chance for them to see science at work outside of the classroom in these fields of endeavor, a place to use their art, a place to use creative writing. And let us not ignore humor in planning our displays. How many of you reading this remember *Liberty's* cover of hydrogen sulfide or "Freshman Chemistry" on the *Saturday Evening Post* (May 4, 1940)? And let us not overlook the cartoons or the comic strips. My students get a laugh out of "The Thrill that comes once in a Lifetime—when the young son starts taking chemistry." Many of you can remember Alladin, Jr. making oxygen and the atom smasher of Mickey Mouse or Walt Disney's series on the Sulfa Drugs and 100 Octane Gasoline.

Imagination is a necessary quality in the research laboratory. Dr. Kettering says: "Despise not the dreamer. Every invention is somebody's dream come true." Did you clip and file the American Cyanamid Company's advertisement on blueprints—"the stuff that dreams are made on?"

AND WHAT about attitudes? Attitudes are very important. If scientific attitudes are to develop from a study of science, the writer finds that they have to be taught directly and systematically in the same manner as a mastery of principles; so why not visualize them and let the bulletin board reveal the understanding and appreciation of the knowledge of the world in which we live. Some of my readers may remember a Red Cross poster which showed the world and a world of children encircling it. At the top of the world are two American children, a boy and a girl, with outstretched hands to the children of the nations. Across the poster is printed, "Friendship through Understanding." The poster is old, but its message is fundamental. The first time I used it was in the study of minerals to explain the interdependence of nations; that minerals are a one-source crop; that minerals are not equally distributed; for example, they

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Toward a National Science Week

LEE R. YOTHERS

Rahway High School

Rahway, New Jersey

AS AN additional aid to promoting science and the science teaching profession on a national scale, the writer last April submitted to the President of the National Science Teachers' Association a proposal as follows: "That the Association become the nucleus for sponsoring the organization of a *National Science Week* in the United States." This suggestion was presented to the Board of Directors. The idea was favorably received by the Board but was tabled to allow additional time for study upon it. The proposal will again be given attention next March at the St. Louis meeting. Then plans will be considered for the feasibility of its realization. However, before undertaking any consideration of the problems connected with the organization of a National Science Week it seems desirable to acquaint science teachers with this proposed movement.

It is recognized that the undertaking would not be a simple one; nor would it be an impossible one. On the contrary, we have many examples where teacher action has been solidified behind successful large scale movements.

AN IMPORTANT phase to be considered in this connection is, "What objectives are sought?" Several may be briefly stated at this time; namely,

1. From the viewpoint of science
 - (a) To aid in the promotion of science on a national scale.
 - (b) To give publicity to recent scientific developments.
2. From the viewpoint of science organizations
 - (a) Encourage cooperative action in mutual promotion of science.
 - (b) Recognition of common problems by different groups.
 - (c) Foster new relationships between organized groups.
 - (d) Develop an awareness of joint responsibility.
 - (e) Build a worthy esprit de corps between organizations.
3. From the viewpoint of science teachers

- (a) Enrich the science department's contribution to its students.
 - (b) Foster department cohesion.
 - (c) Develop new science interests for teachers.
 - (d) Encourage science teachers to become better acquainted with their own teaching field and its requirements.
 - (e) Afford an opportunity for science teachers to honor workers in their own profession.
4. From the viewpoint of science students
 - (a) Encourage student interest in scientific activities.
 - (b) Promote the development of scientific skills in students.
 - (c) Afford an opportunity for young people to participate in science activities.
 - (d) Encourage students with above average abilities and outstanding personalities to enter professions related to science, including science teaching.
 5. From the viewpoint of laymen
 - (a) Aid laymen to learn more about the contributions of pure and applied science to society.
 - (b) Reduce prejudice toward science.
 - (c) Promote school community co-operation through science programs.
 - (d) Encourage more generous support for equipment and supplies for science teaching.

THE QUESTION may be asked, to whom should responsibility be delegated for this program? Obviously its success would depend upon inclusion and, in addition, cooperation of all science organizations. Ultimately, the success of this project would rest upon individual science teachers throughout the nation.

Today, there are many well established science organizations in the country. While

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THE SCIENCE TEACHER

Science Consumer Education Project No. 2

HAROLD E. WISE, Chairman

University of Nebraska

Lincoln, Nebraska

THE report representing the results of the first cooperative project between the consumer Education Study of the National Association of Secondary School Principals and the National Science Teachers Association is now in print. The report, in booklet form, *The Place of Science In The Education of The Consumer*, is available from the publisher, The Consumer Education Study, 1201 Sixteenth Street N. W., Washington D. C.

As an outgrowth of the first report the Consumer Education Study has recently authorized a second grant to the National Science Teachers Association to be used in working out specific recommendations concerning the use of commercially prepared materials in science instruction.

The personnel of the committee which has been appointed to represent the association in working out this project is: Anna E. Burgess, Supervisor of Elementary Science, Cleveland Public Schools, Cleveland, Ohio; Charlotte L. Grant, head of department of Biology, Oak Park-River Forest High School, Chicago, Illinois; R. W. Lefler, Instructor, Science Teacher Training, Department of Physics, Purdue University, Lafayette, Indiana; and Harold E. Wise, (Chairman) Associate Professor of Secondary Education and Supervisor of Sciences, Teachers College, University of Nebraska, Lincoln, Nebraska.

AT A recent meeting of the Committee and of representatives of the Consumer Education Study held in Washington D. C. the scope and objective of the project were agreed upon and the general method of procedure and a tentative time schedule were outlined as follows:

Objective: To make recommendations to the National Better Business Bureau relative to specifications for booklets, charts, exhibits, models, and pictures useful in the field of science instruction at pre-college levels.

Method and Tentative Time Schedule:

A. Set up physical specifications (not relating to content) for each of the five

types of material, i.e., booklets, charts, exhibits, models, and pictures. (This was accomplished in tentative form at the Washington meeting.

B. For the purpose of collecting and organizing initial suggestions relative to content specifications for the respective types of materials and the formulation of tentative area reports the science field and committee responsibilities were divided as follows:

Science and Health (Kindergarten to 6, inclusive)

Anna E. Burgess, Cleveland, Ohio
Science and Health (Grades 7-9 inclusive)

Harold E. Wise, Lincoln, Nebraska
Biological Sciences

Charlotte L. Grant, Chicago, Illinois
Physical Sciences

R. W. Lefler, Lafayette, Indiana

Each of the committee members designated above have formulated plans for the collection of suggestions relative to their respective areas of the science field, which will involve collective participation of association members and other science teachers within their geographic localities.

C. A meeting of the committee is scheduled for approximately March 1, at which the four area reports will be synthesized and a preliminary report on the project formulated. It is intended that in final form the content specifications will not only be classified by topics of the conventional courses in science but will also be cross referenced to show possibilities for use in courses or units relating to such fields as conservation, safety, aeronautics, etc.

D. It is expected that the preliminary report can be sent, early in March, to a number of consultants representing the various science interests and geographic localities throughout the country. Per-

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Science for Society

EDITED BY JOSEPH SINGERMAN

• A department in which science is presented in its close relationship to the individual and in which guidance is given in causing the individual to recognize the methods of science and its vast social implications.

International Scientific Cooperation

HARRY GRUNDFEST

College of Physicians and Surgeons

New York, New York

EDITOR'S NOTE: Our guest contributor in this issue is well known for his outstanding work in the field of electroneurophysiology. He has pursued this specialty at the Johnson Foundation for Medical Physics, at Cornell University Medical College and at the Rockefeller Institute for Medical Research; and during the war was on leave from the Institute for Physiological Research with the army and with the Office of Scientific Research and Development. He is now Research Associate in Neurology at the College of Physicians and Surgeons, Columbia University. His many years of productive specialization have not prevented Dr. Grundfest from taking an active interest in the relation to the welfare of humanity of the work of scientists. His indefatigable activity in the American Association of Scientific Workers has been a guiding spirit and a source of inspiration to fellow scientists nationwide. He does not merely talk and write about international cooperation; his intelligent efforts have been of material aid in initiating developments that are beginning to show results in bringing together scientists of the Americas, as well as in influencing international cooperation of scientists in general.

Need for Cooperation

IT IS by now a truism that the atomic bomb has made international cooperation a necessity which must overpower any and all differences that exist among nations. Scientists, the world over, can make a very great contribution toward the success of international cooperation on the economic and political levels by developing, among themselves, a degree of cooperation far greater than that which existed before the war, and particularly cooperation based upon the United Nations Organization (UNO) and its United Nations Educational, Scientific and Cultural Organization (UNESCO), recently formed in London as a subsidiary of its Social and Economic Council.

The stages of international cooperation in the broadest aspect are three, and, as usual in such matters, all three stages are developing simultaneously. They are, 1) the work-

ing out of an international, cooperative approach on all major problems; 2) the development of international safeguards for the peace and security of the world; and 3) the formulation of a program of economic and social aid—including scientific, technical, educational and cultural aid—by the stronger, more highly developed countries, for the weaker, less developed peoples.

As scientists and as teachers, our main concern with these problems, in-so-far as it is distinct from our concern as citizens, is to discover how we can make our specialized contributions to these various phases of international cooperation. An exploration of the possibilities will be the major concern of the remainder of this article.

How Help Develop International Cooperation?

SCIENCE, education, and the arts have traditions of internationalism which are probably stronger than those in any other field of human relations. Through these traditions, and because of the high regard in which culture is held by most peoples, the strengthening of international cultural ties will inevitably lead to the strengthening of international cooperation, as a general practice, in other fields. This psychological and social effect has come to be recognized widely. For example, the State Department now has a Division of Cultural Affairs, originally set up primarily for the purpose of fostering Latin American relations. Because of the success of its work, it is now proposed, through the Bloom Bill, to expand these cultural activities to world-wide proportions. The program looks to facilitating the exchange of students and scholars, the support of international congresses in all fields of

science and culture, and the interchange of scientific, educational, and related information. It is aided particularly through a system of attaches at all our major legations.

Another example of this growing recognition may be found in the latest Congressional proposals for a National Science Foundation (S. 1720, sponsored jointly by Senators Kilgore, Johnson, Pepper, Fulbright, and Saltonstall). Section 9, of this bill, dealing with international activities of the Foundation, instructs the latter "to conclude agreements with foreign governments . . . relating to the exchange of scientific and technical information" and "to cooperate in any international research or development activities . . .".

Study and Discussion Essential

These are important first steps on a governmental level. Their success will depend largely on the degree to which scientists and teachers participate in working out a detailed program and in carrying it through. Teachers and scientists in all parts of the country should therefore study carefully the various legislative proposals, discuss among themselves their special needs, interests, and views on a program and transmit them to the proper governmental agencies, notably the Division of Cultural Relations of the State Department and the Subcommittee on War Mobilization of the Senate Military Affairs Committee.

ORGANIZED activity of this kind, and even that by individuals, does produce results. In evidence, I can cite the experience of the American Association of Scientific Workers (AAScW), which, because it has colleague AScW's in the various British Commonwealths and in France and China, has been particularly active in the field of international scientific relations. Thus, when we first proposed the establishment of scientific attaches in our legations, it was discouraged by the State Department. Four years of wartime experience has, however, changed that opposition into support. Similarly, the American and British AScW's some two years ago proposed a scientific body under the aegis of the United Nations. It was the determined activity of our two associations that changed the original program for a United Nations Educational and Cultural Organization into

the UNESCO. The title itself was coined by Dr. Joseph Needham, of the British AScW, the man who headed the British scientific mission to China. The program of international activities envisaged for the National Science Foundation follows closely our proposals first made by the AAScW in a pamphlet, "The Future of American Science."

How Can Scientists Help to Promote International Security?

The major problems of international security are, of course, dependent upon policy levels which are more complex than those to which scientists can contribute on the specialist levels. Our major contributions must therefore come from our status as citizens; citizens who are specially informed of the tremendous destructive possibilities of technological weapons, such as the atomic bomb, guided missiles, planes of advanced design, and the chemical and bacteriological weapons that could be unleashed in a future war. As specialist citizens we can also present the obverse of the medallion. We can stress the great benefits that would accrue to the world through the use of science for the constructive purposes of peace. As citizens who can speak with authority, we should uphold the ethical and humanitarian aspects of the rational development of science for the benefit of mankind, rather than its distortion to produce weapons of unparalleled destruction.

The example of the "revolt of the scientists," as commentators have called it, is a powerful stimulus to future activity. This "revolt," which has developed not only in our own country, but throughout the world as well, has made a vital contribution to international cooperation in the control of the atomic bomb. In our own country, this "revolt" succeeded in changing the minds of many Congressmen and of other national leaders who at first had thought that the atomic bomb had given us a diplomatic club over other nations. It has helped to mold public opinion to such an extent that the first attempt to force through legislation for a disastrous isolationist atomic policy, the May-Johnson Bill, has been defeated. As a result, our policy has changed over in the direction first advocated by the AAScW on

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Some Experiments in Action and Reaction

H. RUCHLIS

Lafayette High School

Brooklyn, New York

THE RECENT emergence of jet propulsion and rocket planes from the comic booklet to the stage of full reality brings forth Newton's Third Law as one of the major topics of importance in the high school physics syllabus. Heretofore it was sufficient to establish the concept and give a number of applications in one or two teaching periods. Today, the approach must be modernized and more time spent on this new method of propulsion, exemplified in jet propulsion and rocket planes, which bid fair to revolutionize air transportation.

1. An effective way to introduce the topic is to announce to the class the startling fact, "I have brought into class with me today a working model of a rocket plane." The pupils crane their necks to look at the demonstration table for this most unusual piece of apparatus. Instead of approaching the table the teacher reaches into his pocket and pulls out a rubber balloon. With great gusto he proceeds to "supply the rocket plane with its energy source," in this case, compressed air. When the balloon is blown up and suddenly released it darts about the room in a series of whirls and turns, in a direction opposite to the opening through which the air is escaping.

The question is then raised, "Why does the balloon move?" This is a natural point from which to start the discussion of the concept of action and reaction.

2. The hooks of two spring balances are tied together. With the teacher holding one balance and a pupil the other, the pupil is asked to pull with 1,000 grams of force. As he does so the balance held by the teacher reads 1,000 grams. The experiment is repeated for 2,000 grams or any other amount of force. The concept of equal and opposite forces is thus made clear. Now the teacher fixes his spring balance to a permanent support somewhere in the room and the pupil is asked to repeat the experiment. In this case the wall or fixed object is shown to be doing exactly what the teacher did, namely, pull

equal and opposite to the pupil's force. This clears up a common source of confusion in which pupils find it hard to understand that a fixed wall can react to a push or pull by an equal or opposite force.

3. The teacher now returns to the original situation in which he held the spring balance in his hand, opposed by the pupil. He makes a very tempting offer to the pupil. "Now, if you will pull your scale with a force of 2,000 grams I shall reward you with a 100 percent mark for your next report card." The class is amazed. Such generosity for such an easy task is beyond understanding. The pupil very confidently proceeds to pull his scale to the required amount. But a hitch develops. The teacher relaxes and does not resist the pull. He goes along with the pull of the pupil. As a result there is little or no tension in the spring of the balance and the pupil cannot pull with the 2,000 grams which are required to get his 100 percent mark. The teacher can then make his point. A force cannot exist unless it has something to pull against; unless there is something to react to the attempt to make the force.

4. This fact is now applied to the way in which we walk. We cannot walk forward unless we have something to push backward with an equal and opposite force. This is easily shown by means of a board and rollers. A piece of 10 inch or 12 inch shelving board about 6-8 feet long is satisfactory. $\frac{3}{4}$ inch or 1 inch dowel rods for the rollers, spaced about 18 inches apart, are placed under the board. A pupil is then asked to stand on the board and walk forward. The board will move backward and the pupil will make very little progress forward. It is wise in this experiment to have several pupils nearby to prevent the pupil on the board from losing his balance and falling. The pupil is now asked to walk backwards. The board moves forward.

TO SHOW that we walk only when we act against something more massive than ourselves, place the board about 2 feet from

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Meeting of National Science Teachers Association

General Meeting

THE FIRST general national meeting of the NSTA is scheduled for March 28, 29, 30, and 31 in St. Louis. Thursday afternoon, the 28th, will be devoted to meetings of the project committees. On Friday and Saturday are general and also division meetings (see the program elsewhere in the journal). Sunday will be the time of the Directors meetings of the NSTA.

Projects Considered

Among the matters to be considered are plans looking to the development of projects and the securing of funds to make the projects possible. At present \$6,500 has been allocated to two projects which may be described briefly as follows:

1). *Commercial Materials Project*: The development of standards and specifications for free and low cost educational materials (booklets, charts, exhibits and pictures) as prepared by manufacturers and distributors of products related to the sciences. The National Better Business Bureau allocated \$2,500 to this project through the Consumer Education Study of the N. E. A. Dr. Harold Wise, University of Nebraska, Lincoln, Nebraska, is chairman. With him on the central committee are Mr. R. W. Lefler, Dr. Charlotte Grant and Miss Anna Burgess. There are other cooperating individuals and consultants.

2). *The Emergency Apparatus Lists Project*: The State Department needed lists of scientific supplies and equipment for the high school and undergraduate college sciences as a means of helping the ten devastated countries of the United Nations Organization to re-equip their schools and colleges. The Scientific Apparatus Manufacturers Association approved \$4,000 for this project. Dr. S. R. Powers is serving as chairman of this project. With him, representing the secondary levels are Morris Meister, Philip Johnson, Prevo Whitaker, F. L. Fitzpatrick, Walter Wachter, R. H. Carleton and G. M. Rawlins. Representing the college levels are R. W. Lefler, Laurence Quill and three others from the AAAS Cooperative Committee on Science Teaching.

Committees Appointed

THE FOLLOWING committees have been appointed and are expected to present at least preliminary reports at the meeting of March 31.

Nominating Committee, 1946.

A. O. Baker, Chairman, Division of Instruction, Board of Education, Cleveland, Ohio. Walter S. Lapp, 724 Derstine Avenue, Lansdale, Pennsylvania.

W. L. MacGowan, 3212 Park Street, Jacksonville, Florida.

Emil Massey, 457 Hancock St., Detroit, Mich. Hanor Webb, George Peabody College for Teachers, Nashville, Tennessee.

Public and Professional Relations Committee.

Reuben T. Shaw, Chairman, 823 Real Estate Trust Building, Philadelphia, Pennsylvania. Leo J. Fitzpatrick, Co-chairman, Senior High School, Brockton, Massachusetts.

Rachael Anderson, R. Will Burnett, Greta Oppe, Hanor A. Webb.

Membership Lists Committee, 1945-6.

Nathan A. Neal, Chairman, Division of Instruction Board of Education, Cleveland, Ohio. Norman R. D. Jones, Reuben T. Shaw.

Membership Committee, 1945-6.

Norman R. D. Jones, Chairman, 5073a Mar-del Street, St. Louis 9, Missouri.

W. Bayard Buckham, Robert H. Carleton, Greta Oppe, Fred W. Moore.

Yearbook Committee, 1946.

Chairman from AAAS Cooperative Committee on Science Teaching.

Dwight Sollberger, representing NSTA; John Hogg, representing NSTA; Reuben T. Shaw, representing NSTA.

Membership Service Committee, 1945-6.

John Hogg, Chairman, Phillip Exeter Academy, Exeter, New Hampshire.

Greta Oppe, Merl Russell.

Budget Committee, 1945-6.

Hugh Muldoon, Chairman, Duquesne University, Pittsburgh, Pennsylvania.

Morris Meister, Reuben Shaw.

Legislative Committee, 1945-6.

Honor A. Webb, Chairman, George Peabody

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♦ PROGRAM ♦

Developed by Cooperating Societies of Teachers of
SCIENCE and MATHEMATICS

National Science Teachers Association

Cooperative Committee on Science Teaching of the A. A. A. S.

American Nature Study Society

Central Association of Science and Mathematics Teachers

National Association of Biology Teachers

National Council of Teachers of Mathematics

in connection with the 1946 St. Louis Convention of the
American Association for the Advancement of Science

March 27—March 30

EXHIBITS

Municipal Auditorium—Open 8:30 to 6:00 P. M.

Be sure to see the special Army Air Force Electronics and Teaching Aids Exhibit.

OFFICIAL JOURNALS

National Science Teachers Association: The Science Teacher

Cooperative Committee on Science Teaching of the A. A. A. S.:

American Nature Study Society:

Central Association of Science and Mathematics Teachers: School Science & Mathematics

National Association of Biology Teachers:

National Council of Teachers of Mathematics:

Thursday, March 28

COMMITTEE MEETINGS

2:00 P. M. N. S. T. A. Science Apparatus for U. N. O. Committee
Hotel Statler—Parlor 104

2:00 P. M. N. S. T. A. Free and Low Cost Teaching Materials Committee
Hotel Statler—Parlor 106

7:30 P. M. N. S. T. A. Science Apparatus U. N. O. Committee
Hotel Statler—Assembly Room #2

7:30 P. M. N. S. T. A. Free and Low Cost Science Teaching Materials Committee
Hotel Statler—Assembly Room #2

8:00 P. M. N. S. T. A. Executive Committee
Hotel Statler—Parlor 102

Friday, March 29—9:30 A. M.

Christ's Church Cathedral, 1210 Locust Street

Theme: Current Problems In Science Teaching

Presiding:—Dr. Philip G. Johnson, President N. S. T. A.

PROGRAM

1. School Administration and Time for Science Teaching
Dr. Morris Meister, Principal High School of Science, New York City.
2. Toward Building America.
Dr. Reuben T. Shaw, Philadelphia High School, Past President N. E. A.
3. Science Teaching Apparatus for the Devastated Countries of the U. N. O.
Dr. S. R. Powers, Teachers College, Columbia University.
4. Free and Low Cost Materials for Science Teaching.
Dr. Harold E. Wise, Teachers College, University of Nebraska.
5. The Place of Science in the Education of the Consumer.
Dr. Nathan A. Neal, Board of Education, Cleveland, Ohio.
6. Discussion Period.

Friday, March 29—1:30 P. M.

Hotel DeSoto—16th Floor

Theme: Problems in Science Teaching of Interest to High Schools and Colleges.
Presiding: Dr. Hugh C. Muldoon, Duquesne University.

PROGRAM

1. Educational Methods of the Army Services.
Dr. Raleigh Schorling, University of Michigan.
2. Standards of Education for Science Teaching.
Dr. K. Lark-Horovitz, Chairman: Cooperative Committee on Science Teaching of the A. A. A. S.
3. Legislation Affecting Science Education in Schools and Colleges.
Dr. Hanor A. Webb, George Peabody College for Teachers.
4. Science Instruction for National Security—1945 Yearbook of the N. S. T. A.
Dr. Dwight E. Sollberger, State Teachers College, Indiana, Pennsylvania.
5. Discussion Period.

Friday, March 29—2 P. M.

Hotel DeSoto—Ball Room

American Nature Study Society
(41st Annual Meeting)

Theme: Conservation Education.
Presiding: Richard L. Weaver, Secretary A. N. S. S.

PROGRAM

1. Field Biology Courses for High School Students as an Aid in the Promotion of Conservation Education.
Miss Edith R. Force, Woodrow Wilson Junior High School, Tulsa, Oklahoma.
2. Conservation Education Opportunities in Parks and Reservations, Illustrated.
Harold I. O'Byrne, Rockwoods Reservation, Glencoe, Missouri.
3. Conservation Education Opportunities in Audubon Clubs and Lecture Programs.
Wayne Short, President St. Louis Bird Club, Director Screen Tours, National Audubon Society.
4. The Conservation Program in Indiana.
Howard H. Michaud, Purdue University.
5. Panel Discussion.
Chairman—Dr. E. L. Palmer, Cornell University; A. A. A. S. Representative.
How to Increase the Teaching of Conservation in our School Programs.
An opportunity for reports of activities of members and other organizations actively engaged in Conservation Education.

Friday, March 29—8 P. M.

Jefferson National Expansion Museum

Annual Meeting of The American Nature Study Society.
Presiding: Charles E. Mohr, President.

PROGRAM

NATURE PICTURES:

1. Nature Education Through Park Museums.
Ralph H. Lewis, Historical Technician, Jefferson National Museum, St. Louis.
2. "Their Business Is Booming"—The courtship display of the prairie chicken in Missouri. Illustrated in color.
Harold I. O'Byrne, Rockwoods Reservation, Glencoe, Missouri.
3. Training Conservation Leaders of Tomorrow. Illustrated in color.
Richard L. Weaver, Educational Director, Audubon Nature Center, Greenwich, Conn.
4. Expeditions for Everyone. Illustrated in color.
Charles E. Mohr, Director of Education, Academy of Natural Sciences of Philadelphia.

Saturday, March 30,—1:30 P. M.
The National Association of Biology Teachers
Hotel DeSoto—16th Floor

JOINT SESSION PROGRAM

Presiding: Dr. E. L. Palmer, Cornell University
Speaker: Dr. Ira Gabrielson, Chief of the Fish and Wildlife Service.

SOCIETY PROGRAMS

National Science Teachers Association
and

The Cooperative Committee on Science Teaching of the A. A. A. S.
Hotel DeSoto—16th Floor—2:15 P. M.
Presiding: Dr. G. P. Cahoon, Ohio State University

PROGRAM

1. Acquisition and Utilization of Surplus Property for Educational Outcomes.
Dr. R. W. Gregory, U. S. Office of Education.
2. Using Visual and Audio Aids in the Classroom.
Dr. G. P. Cahoon, Ohio State University.
3. Instructional Devices and Their Uses.
Capt. D. L. Hibbard, U. S. Navy.

The National Council of Teachers of Mathematics
Hotel DeSoto—Parlor D—2:15 P. M.
Presiding: Dr. Raleigh Schorling, University of Michigan

PROGRAM

Panel Discussion: Projects of the Commission on Post-War Plans

Members of the Commission:

Dr. William Betz	Dr. H. Vernon Price
Dr. William A. Brownell	Dr. William L. Schaaf
Dr. Walter H. Carnahan	Dr. Roland R. Smith
Dr. Eugenie C. Haasle	Mrs. Ruth Sumner
Dr. Virgil S. Mallory	Dr. F. Lynwood Wren
Dr. C. V. Newsom	Dr. James H. Zant
Dr. Mary Potter	Dr. Raleigh Schorling, Chairman

The National Association of Biology Teachers
Hotel DeSoto—Ball Room—2:15 P. M.

Saturday, March 30—6 P. M. Dinner

Hotel DeSoto—16th Floor

Planned and directed by the National Association of Biology Teachers.
All Societies are invited to attend.

Speaker: Dr. Otis W. Caldwell, General Secretary, A. A. A. S.
At 9:30: N. S. T. A. Committee Meetings in Parlors A and B.

Sunday, March 31—9:00 A. M.

Hotel DeSoto—Parlors B and C

N. S. T. A. Board of Directors Meeting and Committee Meetings.

COMMITTEE ON PROGRAM

Glenn W. Blaydes
Phillip G. Johnson
Norman R. D. Jones
K. Lark-Horovitz
Morris Meister, Chairman

Friday, March 29—6 P. M. Dinner
Hotel DeSoto—15th Floor

Theme: Unity and Action in Science Education.

Presiding: Dr. Philip G. Johnson, President N. S. T. A.

Price \$1.75. Advance Reservations may be made through Mr. Nathan A. Neal, Board of Education, Cleveland 14, Ohio, not later than March 22.

At 9:30 P. M. N. S. T. A. Committee Meetings in Parlors B and C.

Saturday, March 30, 9:15 A. M.
Hotel DeSoto—16th Floor

JOINT SESSION PROGRAM

Presiding: Dr. Morris Meister, High School of Science, New York City.
Science in the High School.

Dr. A. J. Carlson, Past President A. A. A. S.

SOCIETY PROGRAMS

National Science Teachers Association
Hotel DeSoto—16th Floor—10:00 A. M.

Presiding: Norman R. D. Jones, Southwest High School, St. Louis

PROGRAM

1. Elementary Science Activities for City Children.
Dr. Jerome Metzner, Elementary Science Supervisor, New York City.
2. Gardening as a Science Activity in a Large City.
Miss Frances M. Miner, Curator, Brooklyn Botanical Gardens.
3. A Project on the Study of Heredity, by the Minnesota Junior Academy of Science.
Dr. Clarence P. Oliver, Director Dight Institute, University of Minnesota.
4. Projects of The Science Clubs of America.
Dr. Watson Davis, Director Science Service.
5. Techniques and Devices in Biology Teaching.
Dr. Prevo L. Whitaker, University High School, Bloomington, Indiana.

Cooperative Committee on Science Teaching of the A. A. A. S.

Hotel DeSoto—Room 208—10 A. M.

Presiding: Dr. K. Lark-Horovitz, Purdue University.

PROGRAM

1. Better Service From Lantern Slides.
Dr. Lloyd W. Taylor, Department of Physics, Oberlin College.
2. Construction of Army Air Forces Training Aids and Application to Civilian School Instruction, Army Air Forces Training Command, Omaha, Nebraska.
3. Procurement of Surplus Aeronautical Property.
Army Air Forces Command, Omaha, Nebraska.

The National Council of Teachers of Mathematics

Hotel DeSoto—Parlor D—10 A. M.

Presiding: Dr. F. Lynwood Wren, George Peabody College for Teachers

PROGRAM

1. Whither Mathematics and Science?
G. H. Jamison, Northeast Missouri State Teachers College.
2. A More Desirable Residual in the Geometry of Space.
Miles C. Hartley, University High School, Urbana, Illinois.
3. Multi-Sensory Aids for Post-War Mathematics Teaching.
E. H. C. Hildebrandt, Northwestern University, Evanston, Illinois.
4. Discussion.

Science Clubs at Work

State Teachers College

Edited by DR. ANNA A. SCHNIEB

Richmond, Kentucky

- A department devoted to the recognition of the splendid work being done by the science club members and their sponsors in the various State Junior Academies of Science. Material for this department, such as student made projects; demonstrations and posters; outstanding club programs; state and regional meeting announcements; should be sent to Dr. Schnieb.

The Austin Junior Academy of Science

ADDISON LEE

Austin High School

Austin, Texas

The Austin High School newspaper, the *Austin High Maroon*, October 21, 1938, carried an article which stated in part:

RESEARCH CONTEST ESTABLISHED FOR SCIENCE CLUBS - - - Encourages Individual Extra-Curricular Effort: - - - A contest in scientific research, demonstration, and exhibits among the two science clubs, Y. T. S. Botanical Society, and Nature Science Club, was announced Thursday, October 13, by - - -. It will close about March 1st.

The projects may be in the form of exhibits, demonstrations, or simple research problems. They will be presented at a single session before a committee of three judges, who will decide the awards on the basis of independent work, and amount of work or initiative on the part of the student; scientific accuracy and thoroughness; value or contribution of the problem; and method of presentation of paper or display of exhibit.

Awards are to be given to the first, second, third, and honorable mention places . . .

About two years later in the fall of 1940, the *Austin High Maroon* carried a story which stated in part:

FIVE SCIENCE CLUBS COMBINE TO FORM AUSTIN JUNIOR ACADEMY OF SCIENCE:—An inter-club organization, which will incorporate the science clubs of the school as a nucleus, is being planned by joint action of the sponsors of the clubs affected, it was learned this week . . .

The new organization will be known as the Austin Junior Academy of Science . . .

Clubs which are planning to be charter members of the academy are the Nature Science Club; the Y. T. S. Botanical Society; the Research Club; the Camera Club; and the Math Club.

Objectives of the new academy are: (1) To foster interest in the fields of biological, physical, social, and mathematical sciences; (2) to bring together a closer organization of clubs having similar objectives; and (3) to establish a larger organization which will result in better opportunities and programs for members.

The academy plans to have at least one regular meeting each semester, with either an outside speaker in some scientific field or some club member who has done outstanding work in his field of study. Other than at this meeting or other spe-

cial activities, the clubs which make up the academy will function independently . . .

Officers for the academy will be elected from the composite body of membership. These will be elected for one semester only and officers representations will rotate from club to club within the academy . . .

The primary activities of the new academy will be: (1) The continuation of the annual science contest started two years ago by the Y. T. S. Botanical Society and the Nature Study Club, and (2) the annual presentation at the commencement exercise of a \$25.00 scholarship to some graduating member of the Junior Academy . . .

These two excerpts from the high school paper illustrate the history and give the objectives and the outline of activities of the Austin Junior Academy of Science. An astronomy club and two "Pre-Med" clubs have been added to the list of affiliated clubs since its original organization.

The value of this program is obvious, although it is difficult to measure and to put into words. For the school, and community it serves as one medium for distribution of scientific information and increases the appreciation of science in the world of today and tomorrow. It works as an important supplement to the science classes. For the student it encourages original investigation, promotes self-improvement, directs correct thinking, and teaches tolerance. As the club member works on his project, he sees more clearly the necessity for supplementing his knowledge with careful research. This does more than broaden his factual foundation. It shows him the relation of his work in the entire field of science and he becomes aware of new aspects of his problem. He realizes the importance of accuracy and sees the need for organization. He studies his method of presentation and

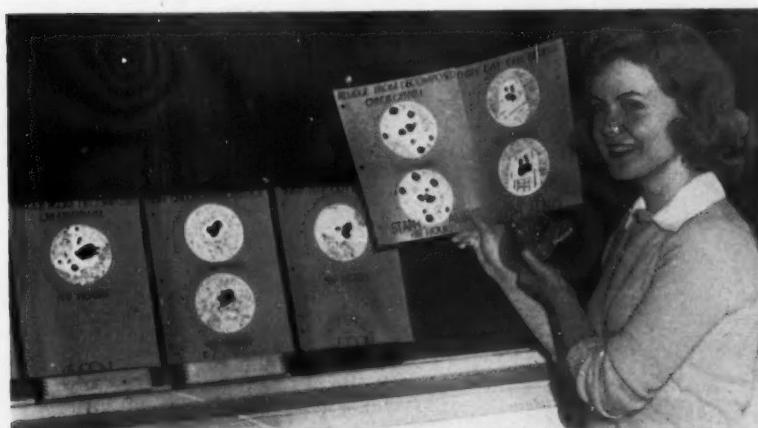
seeks to make his demonstration or discussion as effective as possible. It improves his poise and prestige and gives him status in the school which he might not otherwise have. It sometimes starts him on the road to a chosen profession and who knows—it may furnish the background for later research and discoveries which will make the world a better place in which to live.

As would be expected, the primary interest making activity is the annual contest meeting held each spring. On several occasions under the specific direction of the Camera Club, the academy has sponsored in connection with this meeting a school wide exhibit of Solon Prints, with ribbons awarded for the best pictures. During the past seven years, eighty-eight papers representing a very great deal of student thinking, study, talent, initiative, and effort has been presented at these meetings. The following list gives some of the outstanding papers for which awards have been made:

- (1) *Observations of Reptiles Taken in the Vicinity of Austin*: C. A. Schutze.
- (2) *Notes on Writing a Science Column in a High School Newspaper*: Ravinna Mathews.
- (3) *An Analysis of the Drinking Fountains in the Austin High School*: Willie Lentz.
- (4) *Bacterial Analysis of Drinking Water in a Rural Community Near Austin*: Carol Ruth McElroy.
- (5) *A Study of Fossils*: Dorothy McGraw and Mary Ethel McCright.
- (6) *Identification of Woods by Means of Microscopic Sections*: Mathis Blackstock.

- (7) *Use of Native Shrubs and Wild Flowers in Landscaping*: Billie Riesenecker.
- (8) *Stains With Other Names*: Patsy Tucker.
- (9) *Structure and Physiological Studies of Coleus*: Jean Begeman.
- (10) *Making Cosmetics*: Marjorie Holcomb.
- (11) *A Treatment of Complex Numbers by Graph*: Paul Carnahan.
- (12) *Incendiary Demonstration*: James Finley.
- (13) *Home Recording*: Bob White.
- (14) *Chemical Analysis of Soil in My Garden*: Cecil Heard.
- (15) *Shooting Wild Flowers (Photography)*: Patsy Tucker.
- (16) *A Study of Inorganic Compounds—The Jigsaw Way*: Conrad Bohn.
- (17) *Insect Enemy Number One*: Ray McIver.
- (18) *Study and Collection of Snails*: Grady Webster.
- (19) *Importance of Fossils in the Geology of the Cretaceous of Central Texas*: Ernest Lundelius.
- (20) *Writing Structural Formulas Clearly*: Dan Moody, Jr.
- (21) *Green Blood*: Ovonne Hanna.
- (22) *Native Plants for Your Aquarium*: Norman Heard.
- (23) *Mosquitoes and Malaria*: Harry Lochte.
- (24) *Experiments with Chlorophyll*: Patsy Seiders.

However, a list of titles tells little. In order to illustrate the quality of work done by these students, one of the papers given last year is published following this article. Of course, we picked the one that received first place award.



Patsy Seiders
wins first award
on experiments
with chlorophyl.

Experiments with Chlorophyll

PATSY SEIDERS
Student

Austin High School

Austin, Texas

In beginning, I would like to describe briefly the properties of this wonderful substance which is directly and indirectly responsible for the world's food supply—chlorophyll. Chlorophyll is the green coloring matter in the green plants. It enables the plant, through the process called photosynthesis, to combine water and carbon dioxide to form sugar. Chlorophyll consists of the pigments xanthophyll and cyanophyll. Decomposition of chlorophyll (removed from the plant) takes place quite readily on exposure to sunlight.

The present investigations are the outgrowth of experiments conducted on the effect of chlorophyll on bacteria by Ovonne Hanna, a student in the Austin High School, last year. She found that chlorophyll solution obtained by boiling privet leaves in denatured alcohol (300 medium sized leaves/100 c. c. alcohol) had a toxic effect on bacteria growing on nutrient agar, while alcohol alone did not. That is—she plated Petri dishes with unknown bacteria and immediately after plating, applied the chlorophyll. After incubating for forty-eight hours, clear zones showing inhibition of growth were present about the chlorophyll while the rest of the plate was covered with bacteria. She tried several methods of applying the chlorophyll—soaking absorbent paper in the solution and then applying it to

the plates; dripping the solution upon the plates through small tubes; evaporating the alcohol from the solution and applying the residue. This last method, using the residue, proved the most effective.

In continuing these experiments we wanted to find out the effect of chlorophyll on known bacteria; the effect of decomposition on its antibiotic power; and perhaps a way to measure the potency of chlorophyll.

For our study we selected three types of bacteria characteristic of the group they represent—*E. Coli*, *Staphylococcus albus*, *Streptococcus lactis*. *E. Coli* is a normal inhabitant of the intestines sometimes virulent when entering other parts of the body; *Staphylococcus albus* is a normal inhabitant of the skin causing infection such as stitch abscess when going beneath the surface of the skin; *Streptococcus lactis* is a factor in the souring of milk. We obtained cultures of these three bacteria from the University of Texas.

In these experiments we used the form of chlorophyll obtained by evaporating the alcohol from the chlorophyll solution as that was proved to be the most effective by Ovonne's experiments. We changed the recipe for the "goo" (as we affectionately call the chlorophyll residue) to 13.9 gms. privet leaves per 100 c. c. alcohol. This amount yields about 4.7 gms. of residue. We allowed some

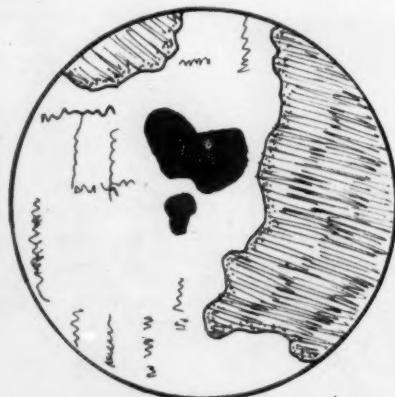


Fig. I. *E. Coli*—Three day old residue
(48 hour incubation period)



Fig. II. *E. Coli*—Residue from decomposed
chlorophyll (48 hour incubation period)

of the chlorophyll solution to stand for several days (usually about three), part of the time in sunlight to bring about decomposition. After decomposition occurred we evaporated the alcohol in the usual manner. The residue obtained from decomposed chlorophyll differed in appearance from the fresh chlorophyll solution. The residue obtained from the de-

composed chlorophyll was much more brittle than that obtained from fresh chlorophyll. It dried more quickly and got much harder. We allowed some of the residue to stand for three days before applying it to the plates. The relative results obtained using the three residues are:

1. *E. Coli* (Figs. I, II, III, IV). Note: The black spots in the diagrams are the "batches" of chlorophyll.

	Time	Result
A. Fresh chlorophyll residue		
24 hour incubation		Inhibition zone of $\frac{1}{4}$ inch (from edge of residue to growing bacteria)
48 hour incubation		Inhibition zone negligible
120 hour incubation		Formerly inhibited area completely overgrown with bacteria
B. Residue from decomposed chlorophyll		
24 hour incubation		Bacteria failed to grow at all
48 hour incubation		Wide inhibition zone
Residue allowed to stand for 3 days (from fresh solution)		
24 hour incubation		Bacteria failed to grow at all
48 hour incubation		Wide inhibition zone
C. Conclusions from <i>E. Coli</i> Tests:		
1. Fresh chlorophyll residue seems to have an inhibitory effect on growth of <i>E. Coli</i> for the first 24-36 hours.		
2. The fresh chlorophyll residue loses its inhibitory effect on <i>E. Coli</i> after 24-36 hours of contact.		
3. Residue from decomposed chlorophyll and residue that has been allowed to stand for several days before application have a greater inhibitory effect on <i>E. Coli</i> than residue from fresh solution.		

II. *Streptococcus lactis*

	Time	Result
A. Fresh chlorophyll residue		
24 hour incubation		Slight inhibition zone
48 hour incubation		Inhibition zone negligible
B. Residue from decomposed chlorophyll		
24 hour incubation		
48 hour incubation		Wide inhibition zone from $\frac{1}{2}$ - $1\frac{1}{2}$ inches
C. Residue allowed to stand 3 days		Inhibition zone great deal less
24 hour incubation		
48 hour incubation		Fairly wide inhibition zone Inhibition zone somewhat less
D. Conclusions from <i>Streptococcus lactis</i> tests:		
1. Fresh chlorophyll residue has a slight inhibitory effect on the growth of <i>Streptococcus lactis</i> .		
2. The inhibitory effect of the residue is lost almost completely after from 24-36 hours of contact with the bacteria.		
3. The inhibitory power of residue from decomposed chlorophyll and residue (from fresh solution) allowed to stand for several days has a much greater inhibitory effect on the growth than fresh chlorophyll residue.		



Fig. III. *E. Coli*—Fresh Chlorophyll residue
(24 hour incubation period)

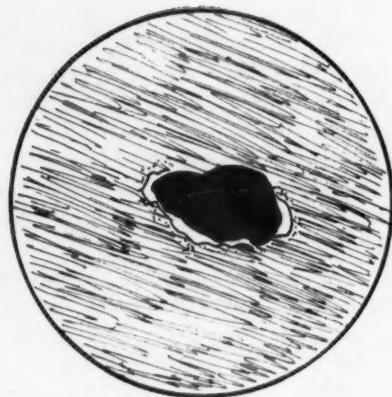


Fig. IV. *E. Coli*—Fresh chlorophyll residue
(48 hour incubation period)

III. *Staphylococcus albus*

Time

- A. Fresh Chlorophyll residue
 - 24 hour incubation
 - 48 hour incubation
- B. Residue from decomposed chlorophyll
 - 24 hour incubation
 - 48 hour incubation
- C. Residue allowed to stand
 - 24 hour incubation
 - 48 hour incubation

D. Conclusion from *Staphylococcus albus* tests:

1. Fresh chlorophyll residue has a slight inhibitory effect on *Staphylococcus albus*.
2. The inhibitory effect is partly lost after 24-36 hours of contact.
3. The inhibitory effect of the residue from decomposed chlorophyll and of the residue that has been allowed to stand is a great deal greater than the effect of fresh residue from fresh solution.

We conclude finally: (1) Chlorophyll solution reacts differently on different bacteria. For example: The *E. Coli* seemed to be inhibited more than the other bacteria used in the present investigation and the known bacteria used in the present investigation did not seem to be inhibited as much as the exposed plates used in the experiments by Ovonne Hanna last year. This may be explained, however, on the basis that the bacteria used in the present investigations may be more virulent than those used in earlier investigations.

(2) The more virulent bacteria seem to be less affected than the others. This point is indicated by the fact that the unknown bacteria in Ovonne's experiments and the *E. coli* in the present ones are affected more than the more virulent types. (3) The decom-

posed solution residue and residue from fresh solution allowed to stand for three days seems to work better than fresh residue. This is difficult for me to explain. It may be that in the process of decomposition a more potent chemical is formed.

Additional experiments on these same bacteria and on other types are needed to definitely prove the above suppositions.

In continuing our experiments we want to examine more thoroughly the nature and action of this substance. The possibilities are many.

We hope to develop a method of measuring the relative potency of different "batches" of the chlorophyll preparation modeled on the Eimer and Amend Penicillin Reader. The potency of penicillin is measured in Oxford

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SCIENTIFIC COOPERATION

Continued from Page 21

August 14, 1945, a few days after Hiroshima, that the machinery for military control of atomic energy be worked out jointly by the powers on the Security Council.

What Can Scientists Do to Aid Social and Economic Cooperation?

AMERICAN scientists and teachers, together with their colleagues in many lands, can look forward to greater demands on their special knowledge and skills when the Economic and Social Council of UNO develops its full program of activities. Just as we now know that "peace is indivisible," in the famous phrase which Maxim Litvinoff coined when he tried to bring about international cooperation for peace in the days before Munich, so are we also learning that the world has become ever more like a single organism. Trouble in one part, like disease in a single organ, may seriously affect the whole. Economic crises in one country, or continuation of the poverty and misery which prevail among the colonial and exploited peoples of Asia and Africa and among the underdeveloped countries of the world, have repercussions on the standards of security, of living, and of culture in even the most fortunate and most highly developed countries.

Engineers will therefore have to be called in by the Social and Economic Council to advise, plan, and carry through power developments and development of other natural resources. Agricultural scientists will be called on to raise productivity and to develop crop varieties. Public health and medical authorities will be required to eradicate disease. Basic to these technological activities will be the need to raise standards of education, of scientific activity and of culture in these less developed regions of the world. Already, through the medium of UNESCO, we have an opportunity to develop a program in these latter, basic fields. The International Relations Committee of the AAScW has recently prepared a program outlining certain possible functions for the scientific section of UNESCO. These are:

1. UNESCO should promote the exchange of scientists, young and old, on a worldwide scale.

2. UNESCO should be charged with the responsibility of facilitating, in every way possible, the prompt interchange of scientific information.
3. UNESCO should take the leadership in the reorganization of scientific abstracting, since many of the pre-war organs were traditionally in German hands.
4. UNESCO should be an active agency to promote congresses of scientists of all nations. It should facilitate the prompt revival of the pre-war international scientific unions and assist in the formation of new unions.
5. UNESCO should aid in the rehabilitation of scientific institutions in areas devastated by the war.
6. UNESCO should give aid and advice to the growing scientific institutions in countries like India, China, and some of the Latin American Republics.
7. UNESCO should undertake comprehensive surveys of the scientific and technical potentialities and resources of underdeveloped regions, and should issue full public reports of the results of these surveys.
8. UNESCO should coordinate its activities with those of other international organizations with scientific and technological functions, such as those concerned with public health, communications, food, agriculture and fisheries, mineral resources, standards and power.
9. UNESCO should become the principal scientific advisory body in the United Nations organization.

OUR committee pointed out that no international organization can succeed without the participation and support of the individual nations, as well as the individuals within these nations who are primarily involved. This requisite has been recognized by UNESCO and by our own State Department. It is proposed that a permanent UNESCO conference, or council, should be formed in the United States and in each of the other participating nations. These bodies, composed of representatives from the widest range of organizations of scientists, educators, and artists would act as the focus within the coun-

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SCIENTIFIC COOPERATION

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try for all international activities under UNESCO, and as the transmitter, from each country, of programs for further UNESCO activities.

The AAScW has made a strong plea to "the scientists of the United States to study with care the above program for the science division of UNESCO, to make recommendations for improvements and additions, and to give their fullest support to the new-born organization. It is the duty of the national science organizations such as the American Association for the Advancement of Science and its member organizations, Sigma Xi, the Federation of American Scientists, and the national and state academies of our country, to act promptly in these matters. If a year hence we find ourselves saddled with an ineffective international scientific organization, the blame for the failure will rest partly upon the shoulders of the scientists of the United States."

UNESCO should therefore receive high

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priority in the activities of American scientists. This does not mean however, that other activities in the sphere of international relations should be neglected, for a strong program of going activities is one of the best aids to the formation of a strong, active and wide awake UNESCO. Lack of space permits only a brief enumeration of some of these going activities. The American-Soviet Science Society and the American-Soviet Medical Society are performing important work in bridging the serious gap which has long separated American and Soviet scientists. The New York Academy of Sciences has been instrumental in bringing together scientists from many lands to discuss various special fields of science. Similar programs are being planned by other bodies. The AAScW has recently developed an extensive program designed to aid scientific cooperation with Latin America, particularly through providing various services and aids to the many students and scholars who are already in this country, and the still greater number who will come in the future years.

BULLETIN BOARD

Continued from Page 17

learned that the people of Greenland worked six months out of a year to give us cryolite for aluminum production; that each piece of stainless steel depended upon the chromite ore in New Caledonia or Rhodesia; that the tin now smelted in Texas City is not a resource of Texas but of Bolivia. All of this took place while we were building our Good Neighbor policy and when our papers were full of such articles as "What South America Means To Us" or "The Spanish Earth Worth a Fight." Today that poster lives again as a way of life for all our thinking—a togetherness not only in a world of things but a togetherness in a world of thought—"Friendship through Understanding." The world calls it tolerance.

HOW WELL I remember the first poster made for this bulletin board which has become such a teaching tool. An art student made it. The border contained new developments in science through chemistry. The central figure was the world and printed across the map of the world were the words:

"In the beginning, God created the heavens

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and the earth;"

Out of that which God gave him, man has made . . .

This was the beginning of this laboratory device, when we could plan our lives definitely for tomorrow's world; but what of today when boys must leave the classroom to do a man's job? The challenge of the bulletin board is still there, this time with Keasbey and Mattison's page (*Time*, October 27, 1941) showing a Bunsen burner—"All the lights have not gone out"—"in thousands of laboratories men work on with this pale flame . . . the lamp of research . . . knowing there will always be a tomorrow."

NATIONAL MEETING

Continued from Page 23

College for Teachers, Nashville, Tennessee.
R. Will Burnett, Norman Jones, Morris Meister, Hugh Muldoon, Reuben T. Shaw.

Program Committee (St. Louis Meeting)

Morris Meister, Chairman, 315 Riverside Drive, New York 25, New York.

Dr. Otis W. Caldwell, Ellsworth Obourn.

Auditing Committee.

W. H. Michener, Chairman, Department of Physics, Carnegie Institute of Technology, Pittsburgh, Pennsylvania.

Paul R. Young.

Proposed Changes in By-Laws

THE FOLLOWING proposed changes in the by-laws of the constitution of the National Science Teachers Association are to be brought up for action. In Article V, Section 5: delete "recording"; delete entire second paragraph. Section 5 will then read: "The secretary of the N. S. T. A. shall maintain a record of all official business of the N. S. T. A. and its Board of Directors. He shall prepare an annual report for the general membership."

In Article III, Section 1: delete "a corresponding secretary"; delete "recording". Section 1 will then read: "The officers of the N. S. T. A. shall be a president, two general and four regional vice presidents, a secretary and a treasurer."

ACTION AND REACTION

Continued from Page 22

the wall so that it moves up against the wall while the boy is still walking on the plank. As soon as reaction takes place against the massive wall the boy is able to walk forward on the plank normally. The same effect may be observed by stages by distributing weights on the plank at intervals to give the board more mass. The relative motion of the boy will increase in that case. In actual walking (as on a road) we are pushing against the earth which is enormously more massive than we are. According to Newton's Second Law the actual acceleration of the more massive earth is infinitesimal compared to the acceleration the equal and opposite force produces in us. The earth actually moves in response to our action, although it is never noticed because the motion is infinitesimal.

It should also be pointed out that friction acts as the link between the action and the reaction. In the case of the plank above, the reduction of friction by use of the rollers prevented the earth from reacting to the boy's action. Actually it also prevented him from exerting force. The pupil actually experiences less force when he is walking on the rollers than when he is walking on the floor. This again illustrates the fact that the action cannot exist without the reaction. The two are actually different aspects of the same phenomenon in nature. They cannot exist separately.

5. To illustrate the manner in which a gun kicks back when a bullet is fired—or to illustrate the manner in which we jump up away from the earth, obtain a large coffee can with flat cover with a rubber tube connected to the side of the can and sealed tightly. The can is mounted on a platform balance or spring scale. When a pupil blows into the closed can the cover shoots up suddenly and simultaneously there is a downward kick due to the reaction on the balance. This is analogous to the situation where we jump up by pushing downward, or to the backward reaction of a gun when the shell is fired.

The same experiment can also be effectively demonstrated with a can and cover commonly used to show the explosion produced by a gas-air mixture (or any other explosive mix-

ture). This experiment again illustrates the fact that the action and reaction occur together. While blowing into the can, or prior to ignition there is no visible effect on the cover or can. Only when the cover moves upward does the can move downward.

WITH THE above demonstrations the teacher can show the universal nature of the law and apply it to all known types of motion. *In every case of a change of motion, it is always achieved by exerting a force in the opposite direction to the desired motion.* Thus an automobile tire pushes the ground backwards to move forward. When rowing or swimming we push the water backward. A boat or airplane propeller pushes the air backward to move forward.

The major difference between jet propelled, or rocket, planes and the conventional propeller plane is that the latter utilizes a complicated mechanism to convert the heat energy of the fuel into rotary motion of a propeller which then provides a backward push (translatory motion) to kick the plane forward. Both the jet propulsion and the rocket simplify this process enormously by providing the backward push directly without the complex intermediary mechanism. It is for this reason that the mechanical operation of these engines is so much simpler (although other difficult problems are encountered).

6. The operation of the jet propulsion motor can be demonstrated conveniently with a rubber or glass tube and a sensitive spring scale (or spring). The end of the tube is tied to the spring scale in a vertical position. When a pupil blows into the tube the reaction of the air rushing upward out of the tube sends the tube in the opposite direction (downward). The amount of downward force is then measured by the stretch of the spring scale. This experiment is far more effective if a compressed air source is available. Full scale deflection on a 250 gram spring balance can be achieved with compressed air. At the same time the end of the hose whipping back and forth provides dramatic testimony to the sidewise component of the reaction caused by the fact that the direction of the air stream is usually not in a straight line with the direction of the string pulling on the balance.

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7. It is interesting to note that the first heat engine ever created (about 2,000 years ago) operated on the jet propulsion principle. At that time, Hero's engine, used to open temple doors, utilized the reaction of steam issuing from jets placed around a pivoted circular container with heated water. This rotary motion may be demonstrated with a simple type of rotary lawn sprinkler. For purposes of classroom use it is obvious that moving water as the source of energy provides certain insurmountable obstacles. However, a compressed air source will also suffice. In this case there is no danger of showering the class. The only essential difference in basic principle from this rotating lawn sprinkler and the rotation of Heros' engine is in the energy source. Hero used the energy of steam as it expanded, due to heat. In our classroom demonstration we utilize the energy of compressed air as it is allowed to expand.

THE ROCKET differs from the jet propulsion mainly in carrying along its own air supply for the burning of the fuel to give

subsequent expansion of the gases. In both cases an essential element in achieving greater force is to increase the speed of the gas issuing from the rear of the engine. Since more force is required to produce high speed gas ejection, the reaction and kick on the plane itself will be greater. This can be shown with the experiment number six above in which a greater speed of air will produce a greater measurable reaction on the spring balance.

The topic of action and reaction also provides opportunity for connection with other fields of human knowledge. The meaning of reactions in psychology, as the result of some action, provides interesting comparisons. Similarly the use of the term reaction in social studies provides interesting comparisons. In both of these fields of psychology and social studies the use of the term reaction connotes the result of the application of an action. A brief discussion of these uses of the terms action and reaction in the world about us will serve to bring home more sharply the importance of Newton's Third Law in our modern world.



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BLOOD TYPING

Continued from Page 15

used. Place a drop of Absorbed B serum on the A or AB cells to be tested. If agglutination occurs, the subgroup A₁ is indicated. If no agglutination occurs, the subgroup A₂ is indicated.

In addition to the A, B, and O genes, it has been discovered that there are two minor supplementary blood genes, and M and N genes (one received from each parent); either two of the same kind MM or NN or a mixed pair, MN. These genes have no effects on transfusions, but reveal themselves in tests. Blood cells may be tested with M testing fluid and with N testing fluid. The procedure is much like testing for the main blood types. Add M testing fluid to blood cells in one ring and N testing fluid to the other. If agglutination occurs in the M side and not in the N, the person has N blood. If agglutination occurs in the N side and not in the M, the person has M blood. If agglutination occurs in both sides, the person has MN blood.

STUDENTS frequently bring cell suspensions from other members of their families to be typed; others have written to members of their families in the armed forces to learn their blood types. Often there have been opportunities to check the typing done in class by the blood type on the identification tags worn by former students who returned while in the armed forces.

The following table shows the distribution of blood types of students typed at Chester High School:

Blood Type	A	B	AB	O	Total
Number of Students	148	36	17	161	362

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Introduction to Genetics, Sturtevant and Beadle, W. B. Saunders Co.

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CONSUMER EDUCATION

Continued from Page 19

sons who are interested and would be willing to serve as consultants should notify the chairman immediately. Each consultant will have the opportunity to make suggestions for revision of the report or relative to additional specifications to be added. Consultants will be requested to submit criticisms or suggestions before the St. Louis meetings late in March.

- E. A progress report will be made at the St. Louis meeting of the N. S. T. A.
- F. It is hoped that soon after the St. Louis meeting the committee will be in a position to present a first draft to the Consumer Education Study for their consideration.

EXPERIMENTS WITH CHLOROPHYLL

Continued from Page 32

or Florey units. The Oxford unit was arrived at by measuring the diameter of the inhibition zone around the point of application of a standard penicillin on a petri dish. The potency of later "batches" of penicillin is determined by its relative effect on the same type of bacteria. Measuring the relative potency of chlorophyll we would determine a standard unit by measuring the effect of a "batch" of chlorophyll on a certain type of bacteria. The potency of later "batches" would be determined by comparison with the standard. In this way we could more easily and efficiently compare antibiotic properties from different plants.

The antibiotic power of chlorophyll may be put to work combating human disease in the world of tomorrow. Poultices of concentrated chlorophyll may be found valuable in fighting skin diseases and localized infection. There are as many plant diseases as animal diseases. It is quite reasonable to think that perhaps since animals have agents in their bodies capable of resisting disease and infection, plants, too, might have natural factors to help them combat disease. If we liken chlorophyll to blood as Ovonne did last year in calling it "green blood" we might compare its antibiotic power to the antitoxins and

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antibacterial agents of the human blood. Perhaps the gardener of tomorrow will apply concentrated chlorophyll substance to his ailing plants as the physician of today uses antitoxins and serums and the physician of tomorrow may use more of nature's product — chlorophyll — in his treatment of human ills.

NATIONAL SCIENCE WEEK

Continued from Page 18

it may seem that each organization has problems peculiar to itself, actually the individual problems are directly or indirectly segments of the larger entity the science profession. We are aware that the record of scientific achievement is a commendable one. Therefore, there is no need to pass in review achievements in this field of human activity. It may be stated, however, that few agencies can equal or surpass the contributions which science has made and will continue to make toward the improvement of man's well being. Why, then,

may not we science teachers pay honor to our profession and its workers through the organization and conduction of a National Science Week?

It is hoped that science teachers from the kindergarten through the university will be cooperatively interested in this procedure. Expressions of opinions and proposals for implementing the idea will be appreciated by the author.

MAKE CONSERVATION WORK

Continued from Page 11

- application of biological knowledge to practical problems of conservation.
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DR. PHILIP JOHNSON

Continued from Page 12

respectful child of highly respected parents—of Education in the person of the National Education Association, and of Science in the fellowship of the American Association for the Advancement of Science.

Dr. Johnson's services to the U. S. Office of Education began many months before his appointment as Specialist in Science. He headed a committee of consultants that met in Washington in June, 1945, to suggest surveys, reports, and bulletins that the Office might publish in the interests of science teachers. Previously, in the summer of 1944, he was chairman of a small committee that presented the urgent needs of science instruction to the Commissioner, defining in condensed form certain problems that are bound to be uppermost in post-war science teaching. This list of problems is in the *Annual Report of the U. S. Office of Education for 1944*, pages 133-138. (Twenty-five cents remitted to the Superintendent of Documents, Government Printing Office, Washington 25, D. C., will bring this valuable report to you.)

If DR. JOHNSON plunges into the work he outlined for the Office (and unknowingly for himself) in this Report of 1944, he is assured of a busy future. His labors should have practical results. He is the calm, quietly efficient type of worker. His speeches have vigor without vehemence. His writings are first well organized, then clearly expressed. He exercises leadership with modesty, and takes his stand with tolerance. Most important of all, he believes that science is the foundation of civilization, but that education is the architect of society. To him, teaching is the noblest profession, and the high school its most strategic level.

We science teachers may congratulate the Commissioner on a wise choice, Dr. Johnson on a challenging opportunity, and ourselves on the future services of a counselor who possesses those virtues ascribed to Cardinal Wolsey by his admirer Griffith (*Henry VIII*, Act IV, Sc. 2):

"... a scholar and a ripe and good one;
Exceeding wise, fair spoken, and persuading."
—Honor A. Webb.

WRITE FOR IT

Continued from Page 32

From Westinghouse School Service you can borrow transcriptions of "Adventures in Research" given in broadcasts. Write to School Service, Westinghouse Electric Corporation, 306 Fourth Avenue, P. O. Box 1017, Pittsburgh 30, Penna.

For a free *Spraying and Dusting Chart of Insecticides* write Pennsylvania Salt Manufacturing Company, 1000 Widener Building, Philadelphia 7, Penna.

Short Stories of Science and Invention is a collection of radio talks by C. F. Kettering, vice president of General Motors. There are fifty-nine stories. For this 126 page illustrated booklet write General Motors Corporation, Dept. S-1, General Motors Building, Detroit 2, Mich. They also supply a 64 page booklet, "*The Automobile User's Guide*," packed with suggestions for making the family car last longer.

Are you interested in *Progress in Nutrition*? This is the name of a four page bulletin issued periodically by Standard Brands

Inc., Department of Applied Research, 595 Madison Avenue, New York 22, N. Y. The December issue deals with margarine as a nutritious and inexpensive food. Ask that your name be put on their mailing list.

The *Classroom Clipper* is an eight page publication dealing with air transportation and South America. Write for it to Pan American World Airways, 135 East 42nd St., New York 17, N. Y. One page is mostly printed in Spanish to help you with the language.

For an up to the minute 36 page booklet on *DDT for Control of Household Pests* write to Federal Security Agency, U. S. Public Health Service, Atlanta, Georgia. Published, Oct. '45.

A free poster, *Safety Instruction in Chemical Laboratories for Students and Teachers*, can be obtained from the Hercules Powder Company, Wilmington, Delaware.

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BOOK SHELF

THE NEW APPLIED MATHEMATICS. Sidney J. Lasley, Southeast High School, Kansas City, Missouri; and Myrtle F. Mudd, Northeast High School, Kansas City, Missouri. Prentice-Hall, Inc., New York. 1945. 431 pp., 15x23 cm., illus.

The New Applied Mathematics is designed to give the high school student a good review of the fundamentals of arithmetic and also afford practice in the use of mathematical principles in the type of problems the average person meets in every day life. This arrangement both motivates the learning and also teaches him how to use the principles he learns.

The first six chapters deal with the fundamental operations, common fractions and decimals, percentage, denominate numbers, ratio and proportion, and measurement. Practical problems are included in each chapter to apply the operations learned.

The next five chapters deal with such things as *Machines and Work*, *Recording Operations and Transactions*, *Problems of the Consumer*, *Care and Handling of Money*, and *Taxes*. The many problems given show how mathematics is used in each area.

Both algebra and geometry in simple form are introduced. The latter is intuitive and does not require demonstrations. Simple geometric form, including similar triangles, are given and their application made clear. The algebra includes fundamental operations, formulas, graphs and signed numbers. These are the features of algebra that the average student will find helpful later on in school or in life.

The book is well illustrated, introduces each unit in a practical and natural setting, gives a helpful vocabulary at the beginning of each chapter, and includes many practice problems in the back to give facility in the use of numbers. This feature is particularly good. The book is to be recommended for the ninth or tenth year of high school.

ALL AROUND US AND HOW DO WE KNOW. Wilbur L. Beauchamp, Gertrude Crampton, and William S. Gray, Reading Director. Scott Foresman and Company, 1944 and 1945. Pupil's Edition, 80 and 96 pages, 20x26 cm, 44 color illustrations. \$.96 and \$1.12 list. Teacher's Edition, 134 and 179 pp., 20x26 cm., \$.96 and \$1.12 list.

All Around Us and *How Do We Know* are new books, for grades two and three, respectively, and follow *Look and Learn* as second and third books in the primary science pro-

gram of the Curriculum Foundation Series. As in *Look and Learn*, all science concepts are presented through pictures, a medium which all the children in the class, not just good readers, can interpret. In *How Do We Know*, simple printed text is introduced in conjunction with the picture study.

The lesson plans that accompany the material in the teacher's guide book indicate the possibilities in learning achievements that can be attained through the skillful direction of the teacher. The pictures used present a wealth of ideas in a most interesting form.

The aim is always to show children ways of thinking about things they have already observed, developing the skills of comparison, contrast, and analysis. Through this procedure the child develops habits of observation and methods of thinking that form an excellent basis for future science work. The books are to be recommended for the primary grades.

WE CAN HAVE BETTER SCHOOLS. Maxwell S. Stewart. Public Affairs Committee, Inc., 30 Rockefeller Plaza, New York City 20. December, 1945. 32 pp., illus. 10c.

We Can Have Better Schools is another of a series of excellent pamphlets on timely subjects that deserve consideration in the schools. The unequal opportunity of children in areas varying in wealth is pointed out clearly and also the results in terms of literacy. Also attention is given to the method of teaching that will result in better citizenship through democratic practices in the study of citizenship problems.

The booklet is based on the discussions at a round table of leading educators held by the Public Affairs Committee last February to formulate a realistic educational policy during the postwar period.

The booklet is well worth thinking through and applying to the situation where you are.

ROCKETS. Willy Ley. The Viking Press, New York, 1944. 287 pp., 13.5x21 cm. \$3.50.

This is a very interesting book for those that want to know something about rockets and the many experiments that have been tried with them. The author allows the inventors and experimenters to tell the story in their own way and so includes much human interest material. The theory of the rocket is

presented as well as discussion of the future possibilities. Just to whet the imagination, some attention is given the spaceship.

AIRCRAFT YEARBOOK FOR 1944. Howard Minos, Editor. Lancer Publishers, New York, 1944. 727 pages, 13x22 cm. Illus. \$6.00.

The Aircraft Yearbook for 1944 covers all types of aircraft, domestic and foreign, their importance and performance, in the war during the past year. It also describes the work of the Civil Air Patrol and Air Transport in the war. Much information is included about aviation training for war.

The book is the official publication of the Aeronautical Chamber of Commerce of America and is also the official reference work of the Army and Navy.

DISCOVERY OF THE ELEMENTS. (Fifth Edition). Mary Elvira Weeks. Journal of Chemical Education, 1945. 578 pp. 15x23 cm. Illus. \$4.00.

For those who have read the preceding edition, this latest book needs no introduction to emphasize its many interesting features. Considerable new and interesting material has been added, over one-hundred pages, that should make it a desirable addition to any library. It traces the discovery of the elements in a most interesting and charming manner from the earliest time to the present. The human side of the discoverers has not been neglected.

A number of new biographical sketches and illustrations are included in this edition. Considerable emphasis has been placed on the history of chemistry in the new world.

AMERICAN MEDICAL PRACTICE. Bernhard J. Stern. The Commonwealth Fund, 1945. 156 pp., \$1.50.

The choice of Dr. Stern, Sociologist, Columbia University and Laye University, to write this, the first of a series of monographs on studies by the New York Academy of Medicine Committee on Medicine and the Changing Order, is a fortunate one. Stern has given us an outline of the evolution of medical practice in America during the past century with an evaluation of its present day problems and shortcomings. He has correlated his observations with the concomitant technological, social, economic and political changes. While scientific progress enormously expanded the potentialities of medical practice, the growth of machine production, industrial urbanization, and concentration of wealth have not only created new health problems but have

resulted in a maldistribution of medical services.—J. S.

AIR NAVIGATION, PART SIX—CONTACT FLYING. McGraw-Hill Book Co., 1945. 182 pp., \$2.50.

Contact flying is the simplest method of navigation in which the pilot is guided by landmarks. This requires corrections for drift and periodic correction of heading. The book is profusely and attractively illustrated with charts, maps and aerial photographs depicting various types of terrains. It is an authoritative presentation published under the supervision of the Aviation Training Division, Office of the Chief of Naval Operations, U. S. Navy.—J. S.

THE RIVER MATHEMATICS. A. Hooper. Henry Holt and Company, New York, 1945. 401 pp. 13.5x21 cm. 292 figures. \$3.75.

The River Mathematics, beginning in the outer fringes of number relationships, runs along in a delightful manner into and well through the heart of mathematics, including calculus. The author puts in enough history and explanation of how the various phases of mathematics developed and the why of units of measurement to make the book of interest to those having an urge to get acquainted with this field without burdening them with the solution of many problems. All examples included in the book to illustrate the phases of mathematics are worked out for the reader.

The book should be of general interest to teachers and students in the mathematics field, to those who would like to refresh their minds with mathematical concepts that have slipped away through neglect and to those who would like to know about mathematics without spending time to master it.

THE FUNDAMENTALS OF PHYSICS. Bowen C. Dees, Professor of Physics, Mississippi College. The Blakiston Company, Philadelphia, 1945.

The Fundamentals of Physics presents the subject of physics very simply and quite thoroughly, relating the principles to modern applications, such as the dropping of bombs and the operation of motors. Following the presentation of theory, numerous modern applications are given. This part is properly labeled "Physics in Modern Life."

The book is designed for those who have not studied the subject and for those who are familiar with many applications but did not understand the principles of physics involved.

News and Announcements

Personnel Announcement

The Princeton Film Center, Princeton, New Jersey, has just announced the appointment of Harry T. Floyd as Director of Sales. Until recently, Floyd was Eastern Manager of the Educational and Industrial Film Division of Walt Disney Productions, Burbank, California.

Miss Bertha E. Slye, formerly of the School Service Department, Westinghouse Electric Corporation, has accepted the position of director of the Educational Department of Ward's Natural Science Establishment, Rochester, New York. Miss Slye has been a contributor to this journal and probably will soon have a good message for us in this new area in an early issue.

Change of Name

Our readers should note that since June 30, 1945, the Spencer Lens Company operates under the name of its parent company and should be addressed as the AMERICAN OPTICAL COMPANY, Scientific Instruments Division, Buffalo 11, New York.

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The above films are distributed by many state and regional depositories and may be purchased from Encyclopaedia Britannica Films Inc., 20 North Wacker Drive, Chicago 6, Illinois.

Here are two free films, *Electronics at Work* and *Music in the Sky*. About one month before you wish to use them write to School Service, Westinghouse Electric Corporation, 306 Fourth Avenue, P. O. Box 1017, Pittsburgh 30, Penna.

Write to the General Electric Company, Schenectady, New York, for a booklet listing their free films. You will find many excellent films that you will want to use.

Illinois Association of Chemistry Teachers

The Illinois Association of Chemistry Teachers will hold their annual spring meeting at the Champaign High School April 6, according to an announcement by Walter Hauswald, president of the association. A field trip is being planned for the morning and a luncheon at noon.

The program will be given in the afternoon at the high school and is now being arranged. Plan to come and renew your acquaintances.

Iowa Association of Science Teachers Meets

The Iowa Association of Science Teachers met in Des Moines, February 1, in connection with the State Education Convention. In spite of inactivity during the war, bad weather and the housing shortage there were about two hundred and seventy five present.

An interesting and constructive program was given. This consisted of an address, *The Release of Atomic Power*, by Dr. Frank Spedding, Iowa State College, Ames; and a demonstration, *Science for the Air Age*, an aviation unit presented by the pupils of Oak Park School, Des Moines, and their teacher, Miss Ruth Leupold. The demonstration was arranged by Miss Margaret Black of the College of Education, Drake University.

Robert E. Templin, Ft. Dodge, was elected president and Edna May Hagans, Des Moines, secretary.

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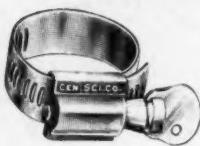
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